INTRODUCTION TO V-RAY
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3DTOTAL.COM EBOOK SERIES

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CHAPTER 01

V-Ray Global Illumination

INTRODUCTION TO V-RAY CHAPTER 01 - V-RAY GLOBAL ILLUMINATION

Software Used: V-Ray, 3ds Max

This series of tutorials is dedicated to the V-Ray renderer for 3ds Max, and will guide you through V-Ray's most important features. Here is a quick look at V-Ray's GUI before we get started:

Irradiance Map GUI (**Fig.00a**)
Light Cache GUI (**Fig.00b**)
Photon Map GUI (**Fig.00c**)

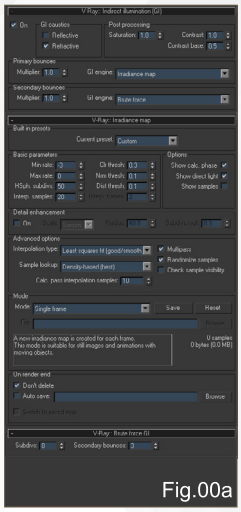
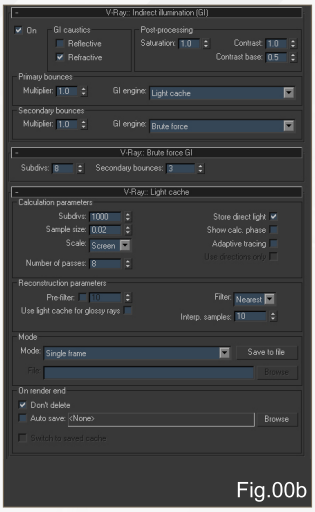


Fig.00a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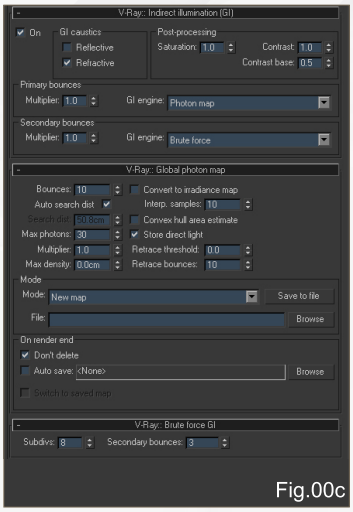


Fig.00c

GLOBAL ILLUMINATION

This first chapter of this V-Ray for 3ds Max tutorial series will cover Global Illumination in V-Ray, looking at the following topics:

GI MODES

- **Irradiance Map**
- **Brute Force**
- **Light Cache**
- **Photon Map**

HOW TO

- **Create ambient occlusion**
- **Use Progressive path tracing**
- **Make GI previews**

LIGHTING A SCENE WITH ONLY GI

- **Find the right Solution for your scene**
- **Conclusion**

Before you begin anything, it is always recommended to work in scale, whether it is inches or centimeters, just to have a physically viable scene. We are going to begin the series with V-Ray's impressive Global Illumination, talking in detail about all the various settings and modes it has to offer.

GI MODES

V-Ray has four ways of interpreting GI, which can be assigned to primary or secondary light bounces. We will look into V-Ray's technical aspects for now, explaining all the settings to help you understand its finer workings.

IRRADIANCE MAP

Irradiance Map (IR Map) is the base of V-Ray's GI engine, and in most cases you will use this solution; it is versatile and easily configurable for high detail or previews, adapted to animation and stills. To put it simply, the Irradiance Map will compute GI more accurately where there are fine details, and coarsely where you have flat surfaces.

Basic Parameters

This is a multi-pass GI solution; the difference between the minimum and maximum rates will give you the number of passes computed by V-Ray at render time.

Min/Max Rate: These are the most important settings of V-Ray's Irradiance Map solution: the Min rate determines the resolution of the coarse GI pass; the Max rate determines the resolution of the finest GI pass computed (a value of -1 will compute an image half the size of the final image; a value of +2 will compute an image four times more detailed than the final image).

The Min rate should always be negative in order to speed up the rendering of flat surfaces; you can go as low as -6 with some gain in render times, however, lower settings might actually slow down the render!

The Max rate, on the other hand, defines the amount of fine details you will see in the GI solution. It will also dramatically slow down render times as you increase it: a value of -2 or -3 is good for visualization; however, for final renders you will want to push this to, or above, -1.

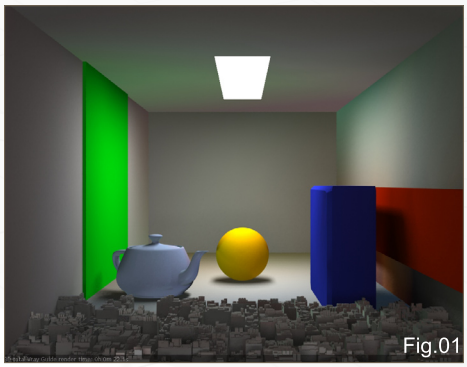


Fig.01

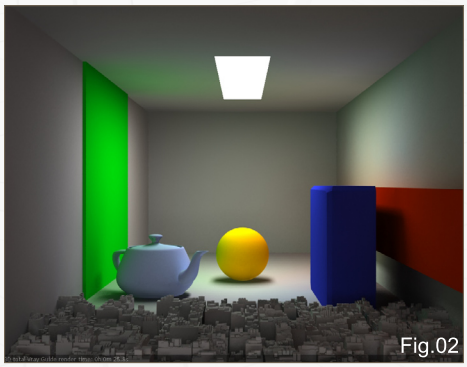


Fig.02

Fig.01 Max rate:-6
Fig.02 Max rate: -4
Fig.03 Max rate: -2
Fig.04 Max rate: 0

Note: these values are for a screen resolution of 800*600, for high resolution renders you can

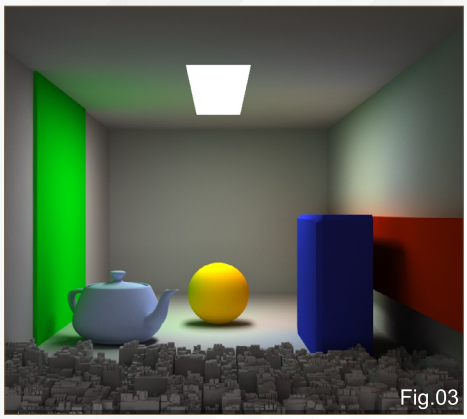


Fig.03

decrease the min and max rates and still get good results.

Fig.05 Resolution 1024*768 – Max rate: -2
Fig.06 Resolution 2048*1536 – Max rate: -4

Color Threshold: Advanced setting: reduce to increase image quality; keep this on default in most situations (0.2).

Normal Threshold: Advanced setting: reduce to improve V-Ray's perception of curved surfaces and fine details. Keep this on default in most situations (0.1).

Distance Threshold: Advanced setting: determines V-Ray's sensitivity to distance between objects. Keep this on default in most situations (0.1).

Hemispherical Subdivision: This controls the quantity of GI samples emitted from a light source: increase this number to get a smoother result; you can reduce it to gain speed but it might get incorrect results and noise. This setting has a direct effect on render times.

This setting can be very useful if you are only using one light source for an entire scene (e.g. Sunlight through a window, bouncing of the walls and floor etc.): a smaller setting will make the GI calculation go faster but will give blotchy results; a higher setting will smooth the GI and accentuate the details but will increase render time. 50 is the basic value, but some scenes might need 100 or more.

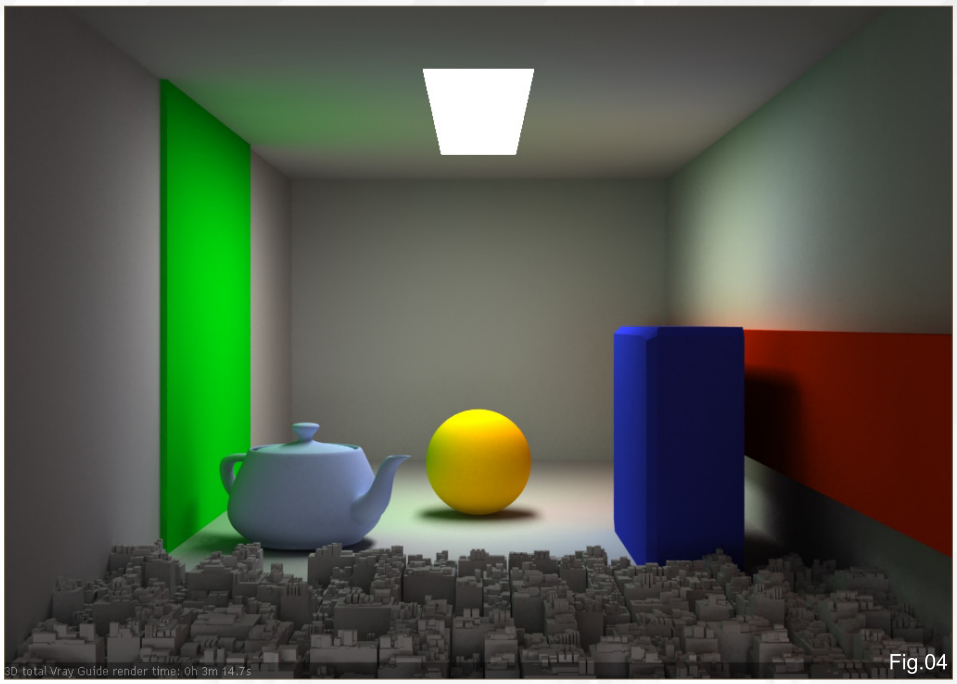


Fig.04

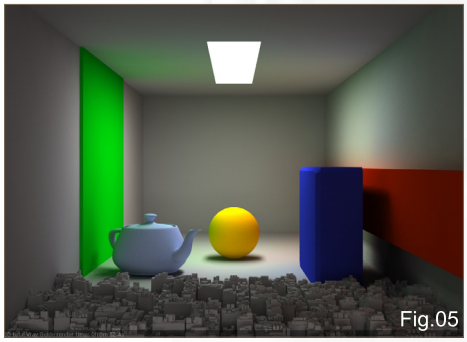


Fig.05

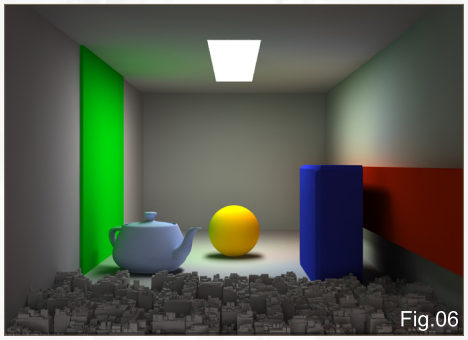


Fig.06

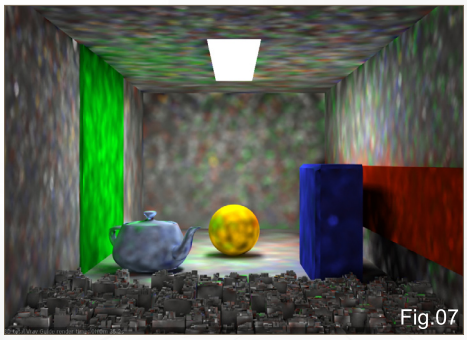


Fig.07

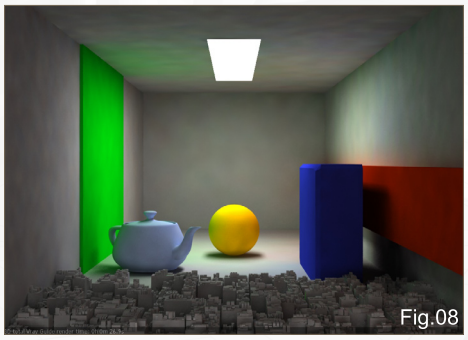


Fig.08

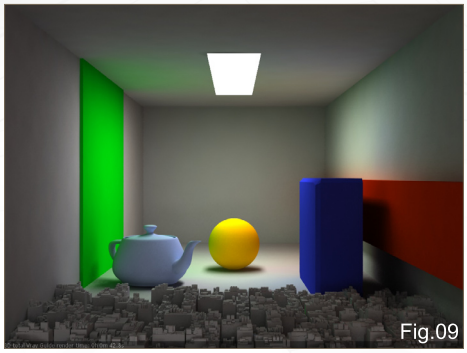


Fig.09

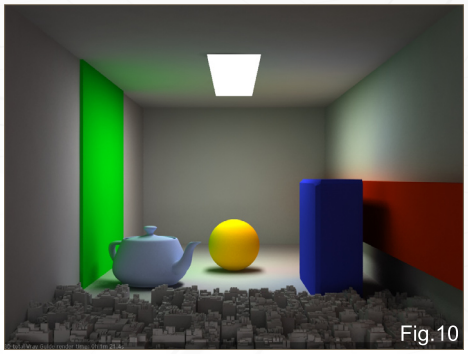


Fig.10

Fig.07 HSph Subdivs: 1
Fig.08 HSph Subdivs: 5

Fig.09 HSph Subdivs: 25
Fig.10 HSph Subdivs: 50

Interpolation Samples: Sets the amount of samples to be used to compute the final GI solution: small values will sharpen the GI while adding blotchiness; larger values will smooth the GI as more samples will be used to make an average – usually keep around 5-15.
To increase with Hemispherical Subdivisions – for example, if you set Hemispherical Subdiv. to 150 – you can set Interpolation Samples to 30-40.

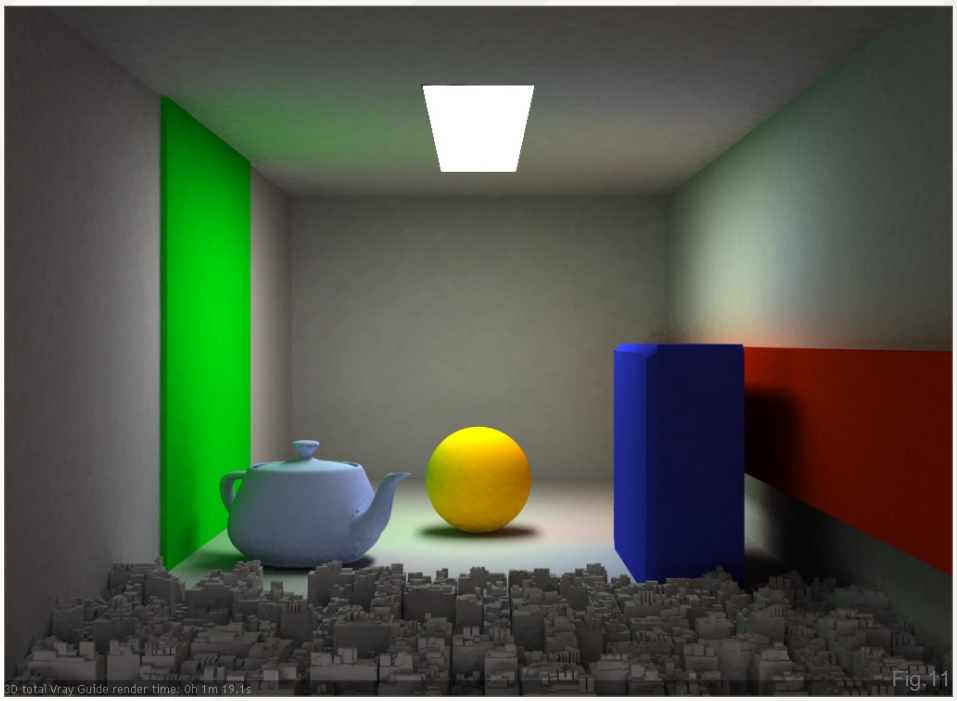
Fig.11 Inter samples: 2
Fig.12 Inter samples: 4
Fig.13 Inter samples: 8
Fig.14 Inter samples: 15

Interpolation Frames: Only used in animation, this will compute additional GI passes to prevent flickering in the final animation.

Note: this is connected to Interpolation Samples and will multiply the number of passes: [2*(*interpolation frames*)+1]*interpolation samples

For example:

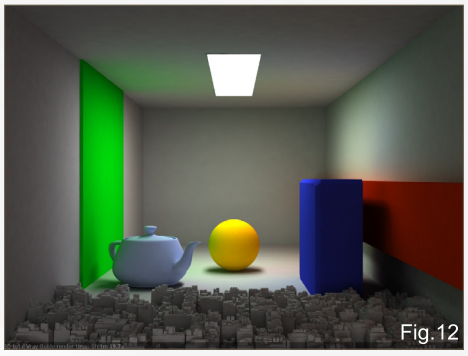
Inter sample = 20
Inter frames = 2
Number of passes = (2*2+1)*20 = 5*20 = 100

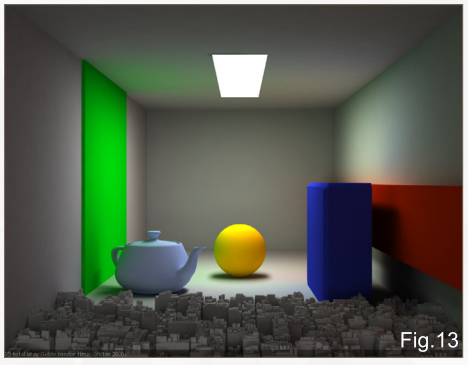


You can reduce the number of Interpolation Samples when Interpolation Frames are used to speed up rendering.

Show Calc. Phase: Will show the GI's progress in the frame buffer during rendering.

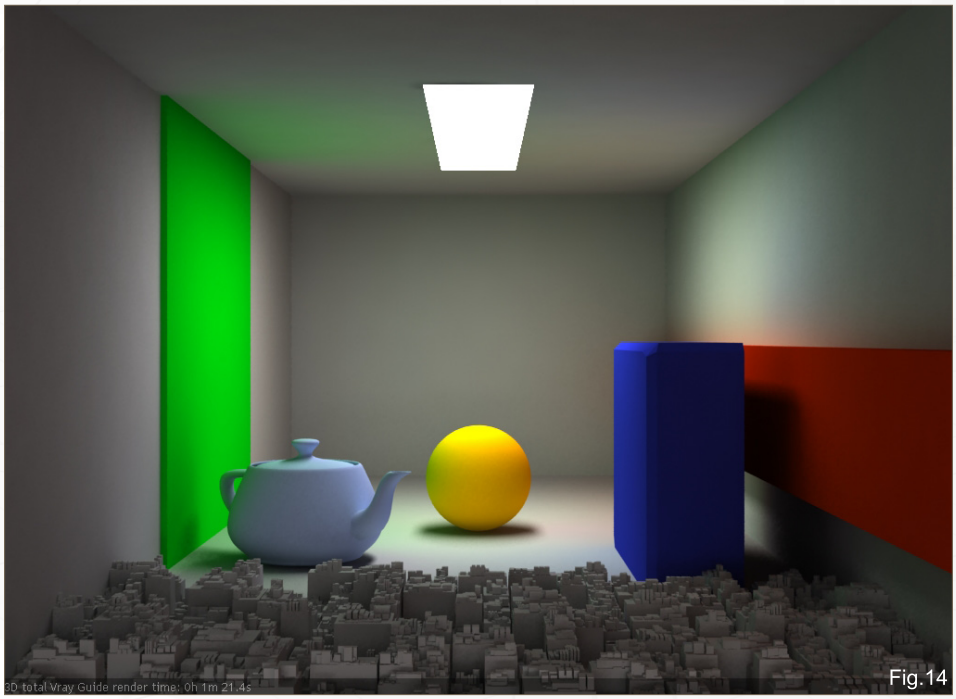
Show Direct Light: will also show direct lighting in addition to the GI solution in the frame buffer during rendering, only work with show calc phase.





Show Samples: Will represent the density of V-Ray's Irradiance Map samples in the final render, displayed as dots.

Detail Enhancement: This increases the GI accuracy for small details, just as Ambient Occlusion would, but without the use of a separate pass. In a way, it works as Ambient Occlusion: increasing light variations around fine details.



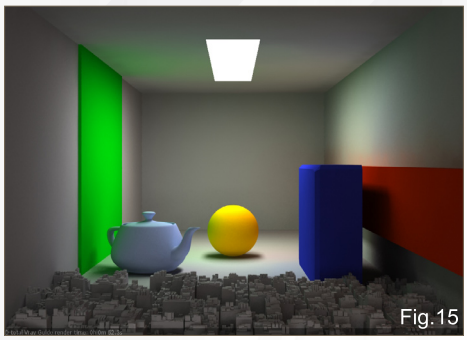


Fig.15

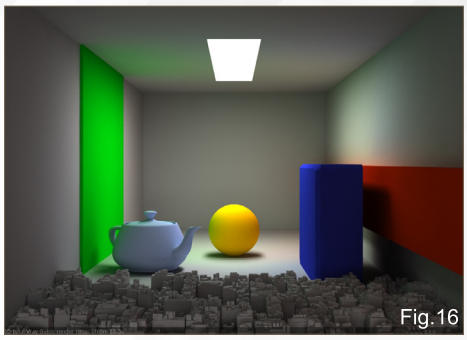


Fig.16

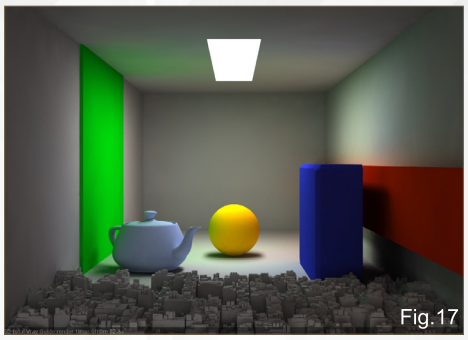


Fig.17

Radius works the same way as it would with Ambient Occlusion.

Subdivision multiplier is similar to brute force's subdivision setting.

Interpolation Types:

Weighted Average: Smoothes the GI samples; produces blotchy results – perfect for speed.

Least Square Fit: IR Map's bread and butter; however, it is also a smoothing method that will lose some fine details – increase the Min and Max rates, or you can use Ambient Occlusion to get those details back.

Delone Triangulation: Produces sharp results: this method produces high quality images with good attention to details; however, it will render slower, and will need an increase in the Max rate and hemispherical subdivisions to remove the noise.

Least Square with Voronoi Weights: A modification of Least Square fit, but slower – one to avoid!

Fig.15 Weighted Average
Fig.16 Least Square Fit
Fig.17 Delone Triangulation
Fig.18 Least Square with Voronoi Weights

Sample Lookup: Use nearest only for previews: quad balanced is good for general use, as well as overlapping; density based is by far the best of the series and should be exclusively used for final renders!

Calc. Pass Interpolation Samples: Should be kept between 10 and 25, this determines the number of iterations it will need in order to find to correct result.

Fig.19 Calc. Pass Interpolation Samples: 1
Fig.20 Calc. Pass Interpolation Samples: 2
Fig.21 Calc. Pass Interpolation Samples: 5
Fig.22 Calc. Pass Interpolation Samples: 10

Check Sample Visibility: Check this if you have problems with light going through thin objects.

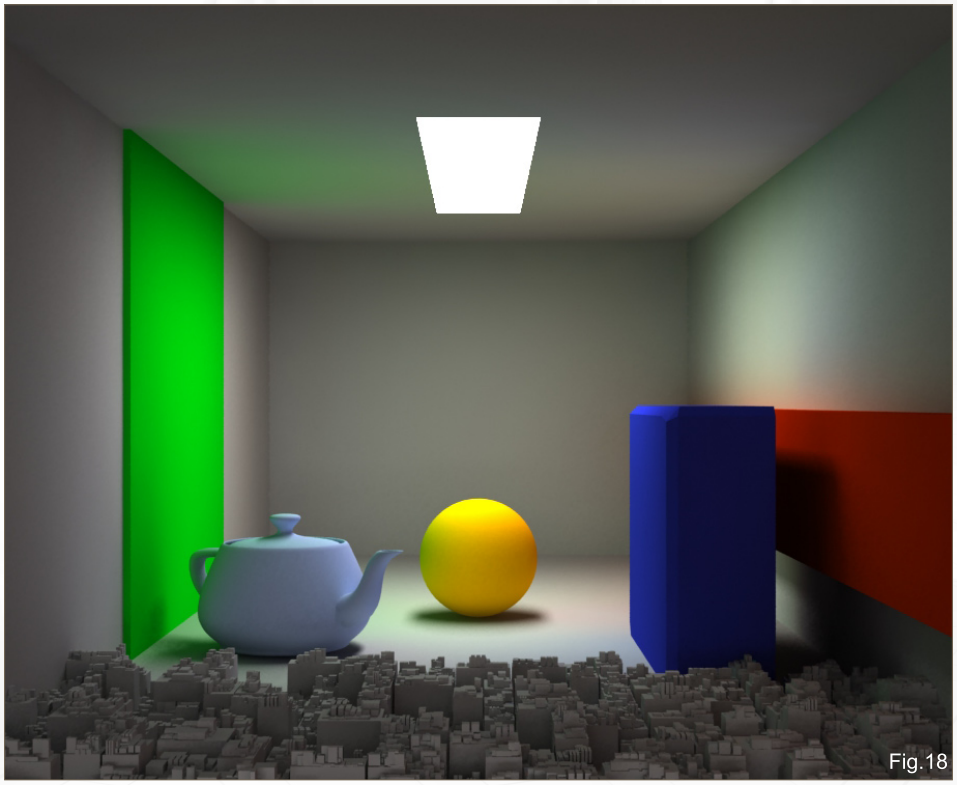


Fig.18

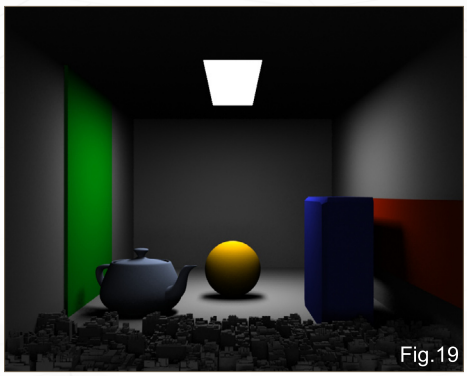


Fig.19

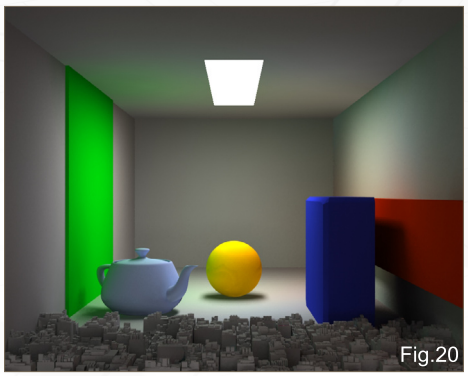


Fig.20

Brute Force

Self explanatory, this GI method will simply compute every light ray as soon as it hits an opaque surface at every possible angle, and restart again computing the resulting rays until it reaches the set number of bounces, resulting in very long render times. It is mainly used for the secondary bounces together with Irradiance Map as primary, but can also be used for primary bounces; if used as the primary GI solution, increase the Subdivisions to remove the noise. This method will usually be darker than IR Map + Light Cache.

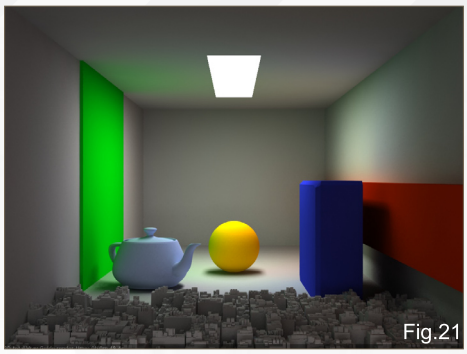


Fig.21

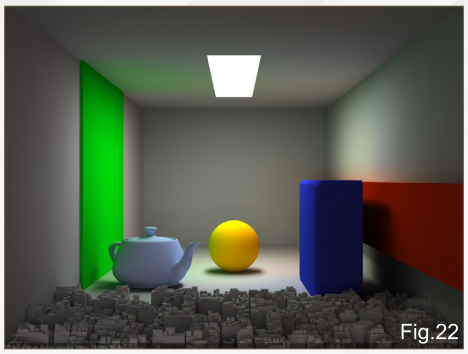


Fig.22

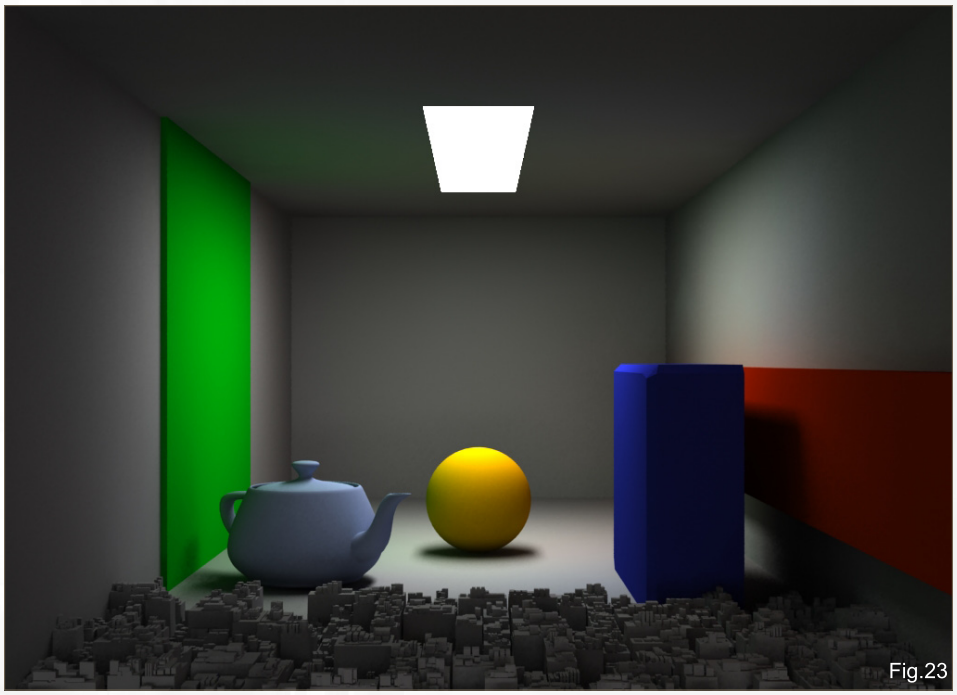


Fig.23

Fig.23 IR Map + Brute Force for secondary GI – notice the overall darkness due to the 1 secondary bounce

Fig.24 IR Map + Brute Force – 3 secondary bounces

Fig.25 IR Map + Brute Force – 8 secondary bounces notice the high render time

You can also use Light Cache as your secondary engine to speed up the renders.

Light Cache

Light Cache can be used in addition to any GI solution as secondary bounces; it can also be used as a primary GI solution; it can make very fast previews; it works with animation and flythrough; and it can even make a final render by itself using the progressive path tracing – plus it's easy to use!

The main settings for Light Cache would be the subdivisions and sample size. You should keep in mind also that Light Cache is dependent on the final image resolution; if you multiply the final output resolution by two, you should do the same with the Light Cache samples.

This is a very good solution, in most situations. Its only drawback is that it doesn't work well with bump maps (go with displacement!).

Note: avoid full white materials (RGB 255, 255, 255) with Light Cache; as individual rays

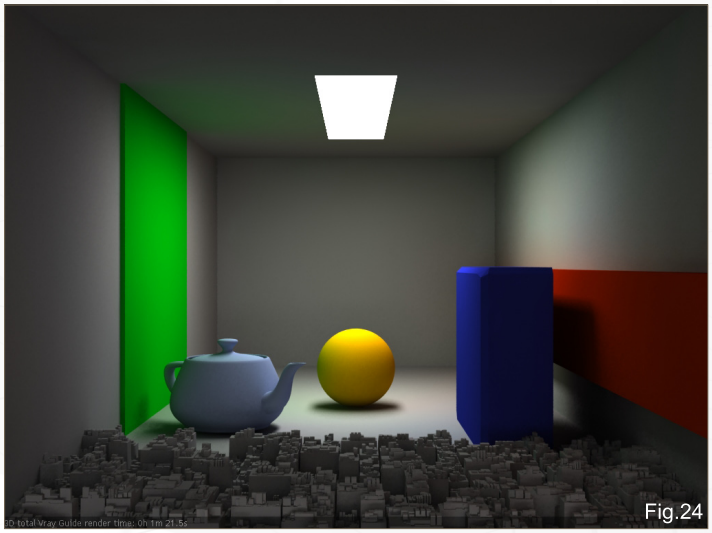


Fig.24

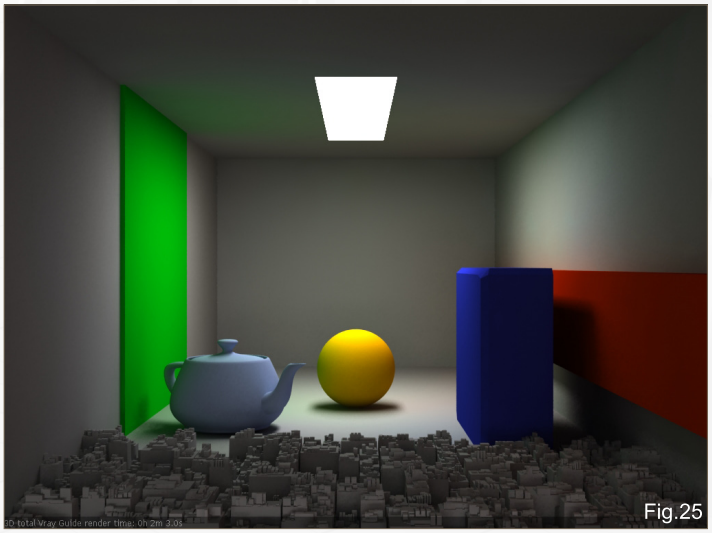


Fig.25

will take longer to dissipate, these will cause excessive render times.

Sample size: Increase to get better results.

Scale: This one can be tricky to get right at first as it is scene dependant; it determines the size of each individual sample that will be computed – a very low sample size will give a more accurate light cache while adding noise, but push it too high and you will lose detail. In screen mode, a value of 1.0 will mean the sample size will be the size of the final resolution; this mode is best for stills and most animations. In world mode, the sample size will be fixed to Max's unit system; that mode will put more details to objects close to the camera. This mode is suited for fly-throughs.

Number of Passes: If you have a Dual Core, set it to 2; 4 for Quad Core; 8 for Xeon owners, and so on.

Store Direct Light: Check this to let the Light Cache calculate direct lighting (this will blur the lights); uncheck if you want sharp lights – this can be useful if you have too many lights in your scene.

Fig.26

Adaptive Tracing: Reduces noise; useful with caustics.

Use Directions Only: Only available with Adaptive Tracing; gives a more accurate result. Strangely enough, this will add noise since it sharpens the Light Cache by adding more samples around fine details.

Pre filter: Increase value if too noisy, or too many artifacts.

Fig.27

Filter:

None: Good for previews.

Nearest: Good results.

Fixed: Best results; keep the filter size at least twice the size of the light cache samples.

Use Light Cache for glossy rays; this option will allow the Light Cache solution to compute glossy reflection and refraction, which can drastically speed up render times in certain cases.

Mode:

Progressive Path Tracing: This mode will let Light Cache render the final image; in order to get a smooth result you will need to increase the subdivision considerably.

Fly through: Very useful for flythrough animation for architectural scenes etc.; this will compute the Light Cache for the entire camera animation at the first frame, and will skip it for the rest of the render.

Single Frame: Basic rendering mode, to be used in most situations.

From File: Load a previously saved Light Cache to skip the calculation.

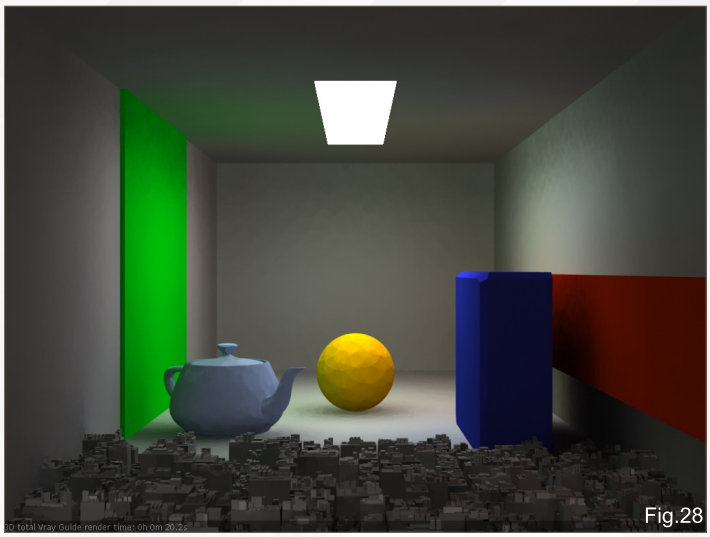


Fig.28

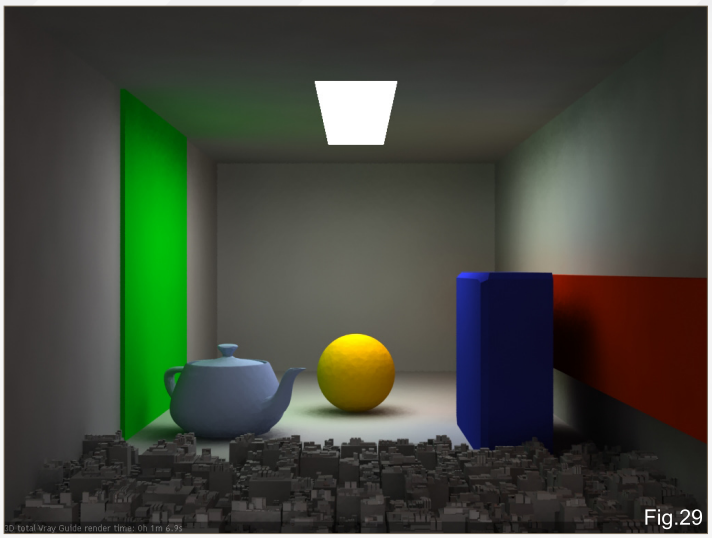


Fig.29

Fig.26 Light Cache only for GI – 50 samples, sample size 0.02

Fig.27 Light Cache only for GI – 250 samples, sample size 0.02

Fig.28 Light Cache only for GI – 500 samples, sample size 0.02

Fig.29 Light Cache only for GI – 1000 samples, sample size 0.01

Fig.30 Light Cache only for GI – 2000 samples, sample size 0.01

Fig.31 IR map + Light Cache only for GI – 1000 samples – the base for a great GI solution!

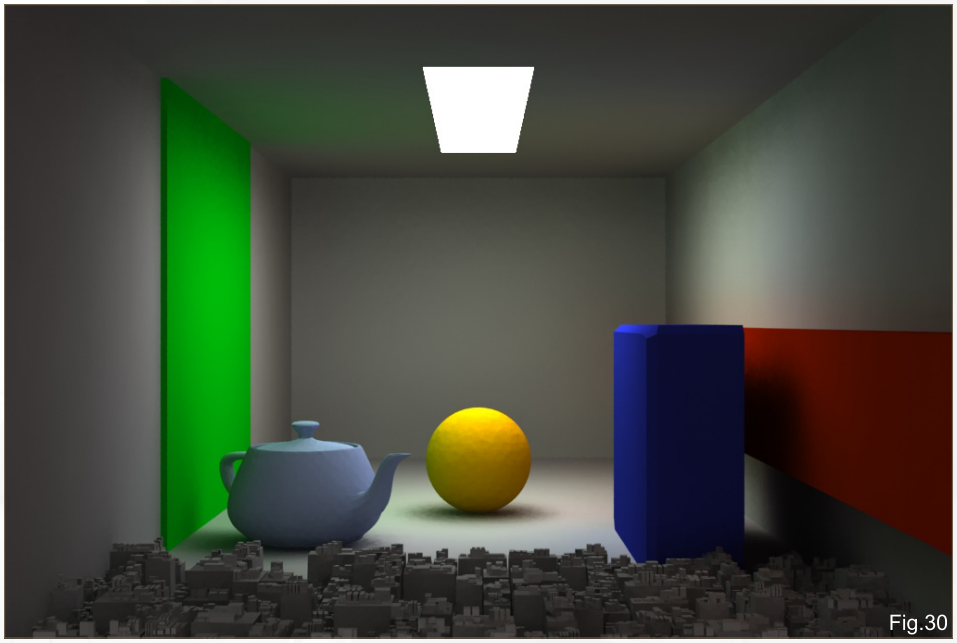


Fig.30

PHOTON MAP

A decent solution for previews, due to the fact that it generates the GI for the entire scene, when compared to just the camera angle; however, it's very inaccurate, it only works with Vray materials, and does not support environment lighting.

It can be used as a primary GI engine, but is much slower than other solutions; Photon Mapping is viable as a Secondary GI solution with Irradiance Map.

Bounces: Increase for better image quality, but this increases render times.

Auto Search Distance: Will let V-Ray calculate the search distance to use; it can be checked most of the time, but results should be better by taking time and experimenting with it.

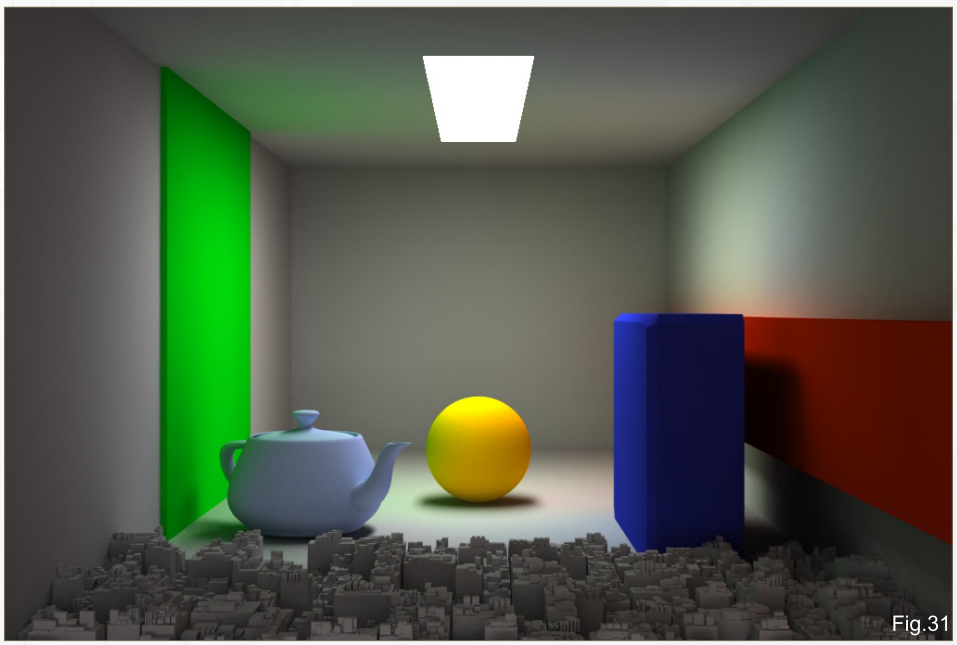


Fig.31

Search Distance: Lets you control the search distance: reduce to render faster with a high amount of noise; increase for the opposite reaction.

Max Photons: Set to 0 to use all available photons.

Max Density: Limits the memory usage of the Photon Map.

Convert to Irradiance Map: Converts the Photon Map to an Irradiance Map; this is not the same as Irradiance Map, this will render faster than a standard Photon Map.

Inter Samples: Same setting as in Irradiance Mapping.

Convex Hull Area Estimate: Check this if you have issues with dark corners; it will slow down rendering.

Store Direct Light: Self explanatory!

Retrace Threshold: If above 0.0, this will add Brute Force GI solution for fine details; it will be slower and might be noisier.

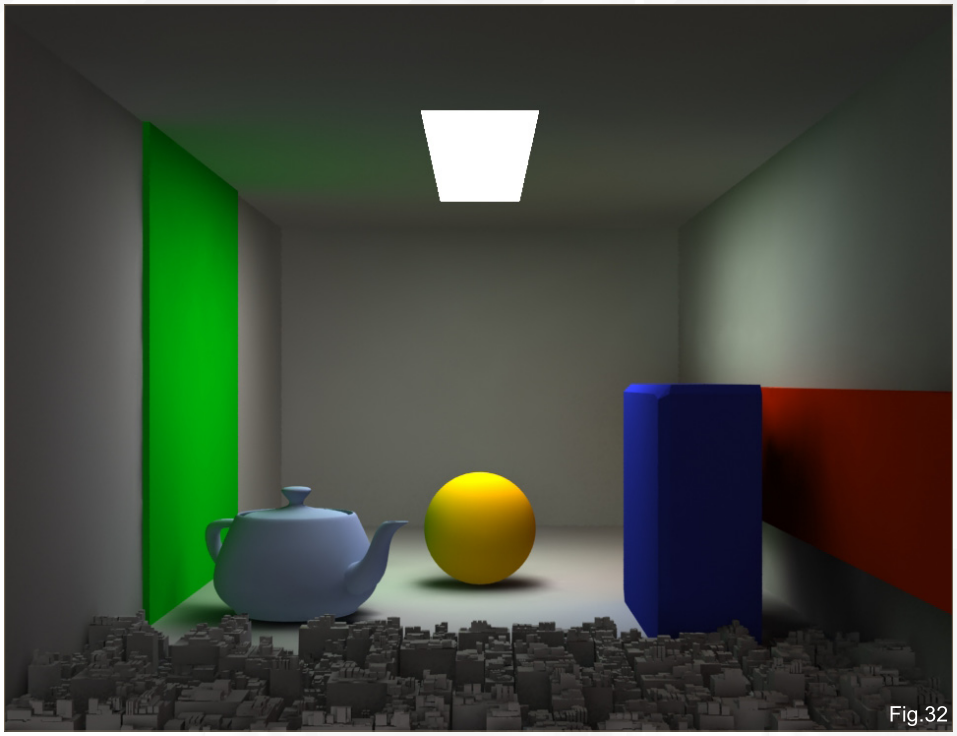


Fig.32

Retrace Bounces: Similar to Brute Force bounces, it only affects if the Retrace Threshold is greater than 0.0.

Fig.32 IR Map + Photon Map – some incorrect results, and quite a long render time
Fig.33 IR Map + Photon Map converted to Irradiance Map – same results but much faster render

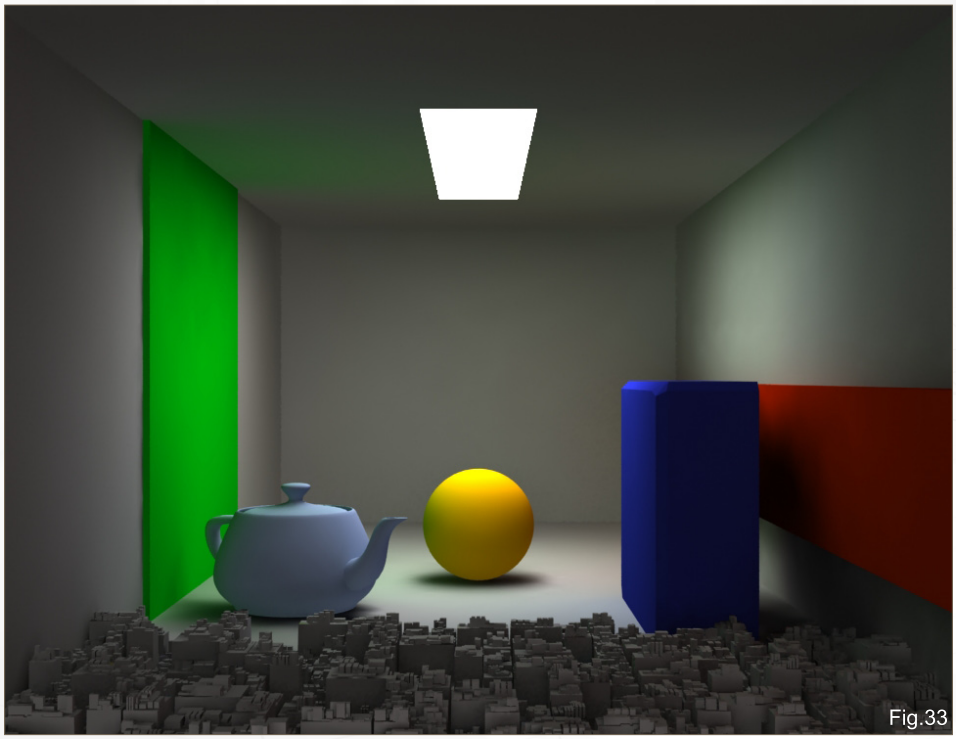


Fig.33

I usually stick with Light Cache and/or Irradiance Map; Brute Force can be used, but get ready for a long wait if you don't like noise!

How To

Create Ambient Occlusion

In the Global Switches tab, check Override Mtl and plug in a VRayDirt Map. This will replace all of the scene materials during the render as the one plugged (more details to follow in **Chapter 2: Materials**).

Use Progressive Path Tracing

Select Light Cache for both primary and secondary bounces in the GI settings; select the mode, Progressive Path Tracing.

Check Show Calc. Phase

Set the Subdivs to 2000 and the sample size to 0.01, and hit render (**Fig.34**).

You will see the scene build up and noise gradually decreasing; however, there are not enough subdivisions to make a smooth image, so to fix this just add more samples.

Set the Subdivs to 4000; this will multiply the render time by 4 (**Fig.35**).

Still noisy along with an increasingly high render time; if you want it smoother, keep adding samples. One way to do this is to set the samples to 20,000 – 100,000 and cancel the render whenever you wish. This will keep the image you see on the screen as the final render.

Note: you can save the Light Cache generated by Progressive Path Tracing and reuse it for standard IR Map + Light Cache renders.

Make GI Previews

With IR Maps

Set the IR Map to the medium preset, then set it to custom; set the Max rate to -7 and the Min rate to -4; set Light Cache as secondary engine and set the number of samples to 250 with a sample size of 0.08. Hit render.

Fig.36 = 6 seconds, and a decent approximation of your scene! You can increase accuracy of the GI by pushing the Light Cache samples a bit, and/or the Min rate.

With Light Cache

You can use Progressive Path Tracing, but this will be noisy, so just set Light Cache as primary and secondary engine, set the sample to 500-1000, and set the sample size to 0.02. Hit render.

See light cache example above (**Fig.29**).

Lighting a Scene with only GI

Now let's tackle a more complicated scene with only sunlight and environment lighting the scene. Let's see what the best way to preview, light and render this scene is, without losing fine details or suffering (not too) long render times (**Final.01**).


Fig.37

The only light source in this scene is a VRaySun, with a V-Ray environmental lighting linked to the sun. Since light will only come in through the windows, this will create a few problems, as direct light will only hit on a small portion of the floor.

Fig.37: Direct light only

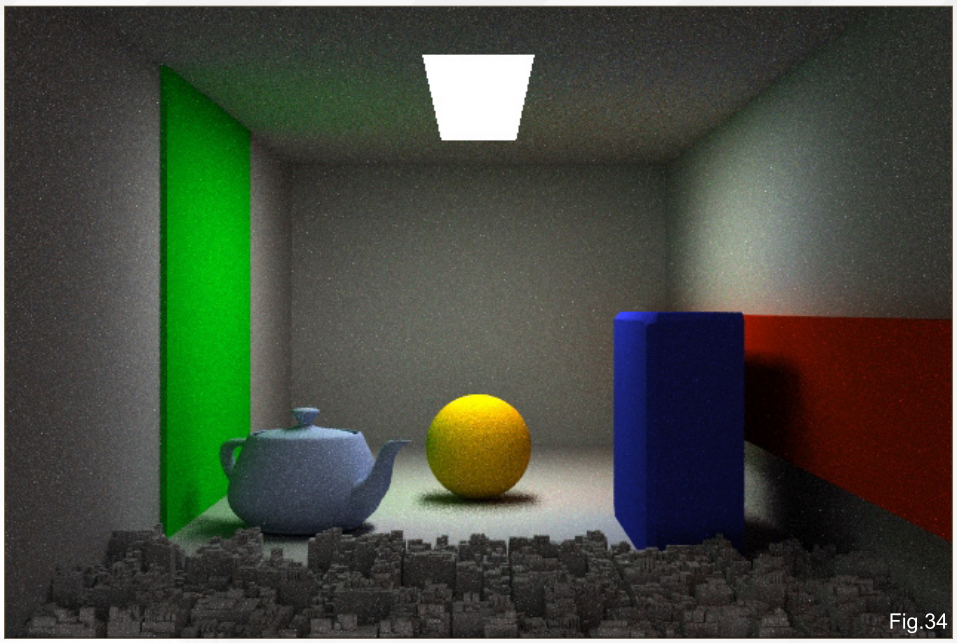


Fig.34

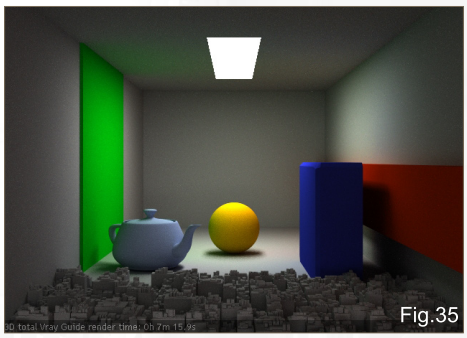


Fig.35

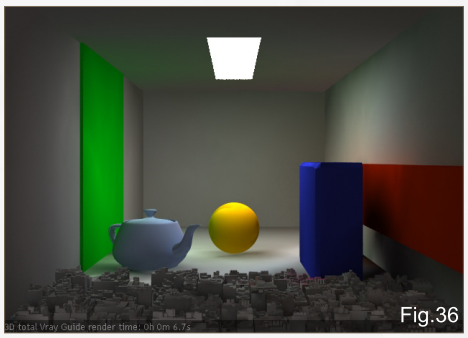
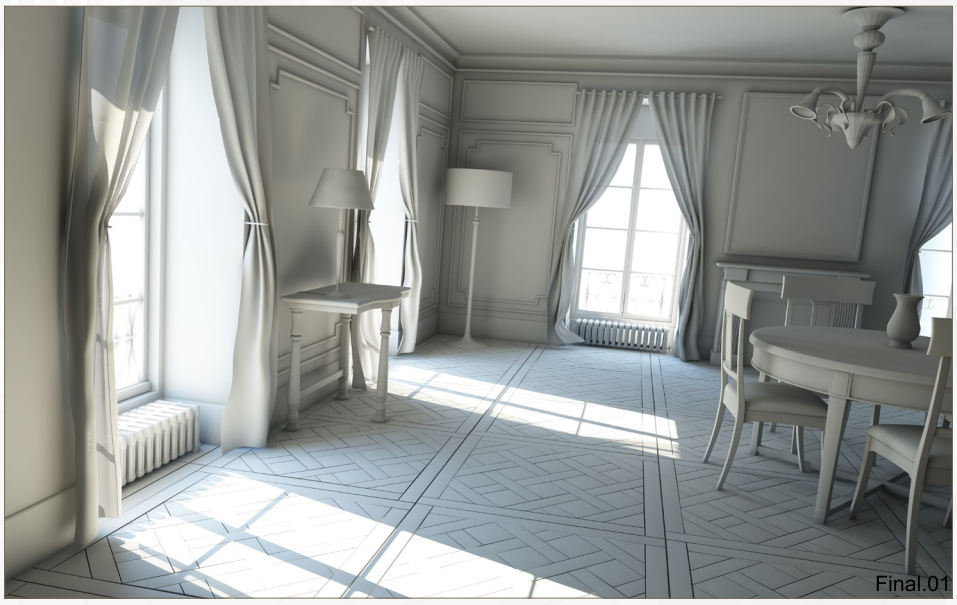


Fig.36


Final.01

Find the Right Solution for your Scene


Fig.38

Fig.38: Irradiance Map + Brute Force GI, set as very low preset – already a four minute render! Let's try this with Light Cache as secondary bounces…

Fig.39: Irradiance Map + Light Cache, same settings for the Irradiance Map, Light Cache at 1000 samples – rendered in 2:30. This is better, but obviously not enough detail in the GI solution, so let's push those settings up!

Fig.40: This time Light Cache Subdivisions are at 2000 and the Irradiance Map settings are on high. A 15-minute render and the render quality is far from perfect; you can see blotchy spots on the wall and ceiling, fine details and corners have a great deal of noise, and you can't see all the floor tiles. The solution for this will again increase render times: we simply need more hemispherical samples; these will add more rays shooting from direct light bounces. Let's set them to 100, increase the Interpolation Samples to 30, and reduce the Min and Max rate to -4 or -1. This time you can keep the Light Cache already computed, as only the Irradiance Map needs to be calculated again.


Fig.39


Fig.40


Fig.41

Fig.41: Now that's much better – you can see a big difference on the left wall and curtain! However, further away from the camera, blotchiness is still ruining the render – same problems on the floor. This time, let's rework on the Light Cache: go back to single frame on Light Cache with 0.003 sample size and 3000 samples; in Irradiance Map set the Interpolation Samples to 50, and the Calc. Pass Interpolation to 15. For better details increase the Color Threshold to 0.4, and finally the Normal Threshold to 0.2.

Fig.42: Completed in 20 minutes and at a decent quality, but not yet production. At this point, several options are viable: you can simply just increase the Max rate to keep tweaking the Hemispherical Subdivision; increase the Interpolation Samples … Lots of tweaking is

possible! On the other hand, you could rely on an Ambient Occlusion pass to sharpen the fine shadows.

If you have a need for a very high resolution render, a good solution is to compute the GI at half of the final resolution, save it, and then render at full resolution. This will drastically speed up the render! The image improvement from computing GI at 5000 pixels wide compared to 2500 pixels is almost invisible. If you absolutely need more details, the wise choice would be to make an Ambient Occlusion pass at full resolution and merge it with the final image (**Final.01**).

Fig.42

CONCLUSION

There, we have tackled most of V-Ray's Indirect Illumination settings and finer workings; you now have the tools to light your creations in many different ways, depending on what you need most – accuracy, speed, stills, animation, SD images, and high-res images. The only advice I can make at this point is to take some time experimenting with V-Ray: play around with the settings, see how they affect the render itself, the memory usage, and the render time – this can really help once you use V-Ray to render that multimillion poly scene, with a multi-layer, glossy Fresnel refraction and SSS material all over the place!

I personally usually stick with Irradiance Map + Light Cache and add Ambient Occlusion for a basic render. The interpolation types' sample sizes, as well as most other settings, always need more or less tweaking depending on the complexity of the scene. For previews I use a low sample Light Cache.

If you're used to overnight renders you can take advantage of Progressive Path Tracing – let it run while you are away at the weekends!

Don't forget that Irradiance Map and light cache are dependent on the image resolution: a GI solution for 640*480 will not be suitable once you render it at 1920*1200; to speed up tweaking find the tricky parts and use render region.

Be sure to catch the next chapter in this series where we'll be looking at Vray Materials!

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3D Total V-Ray Series | render time: 0h 43m 34.1s

Final.01

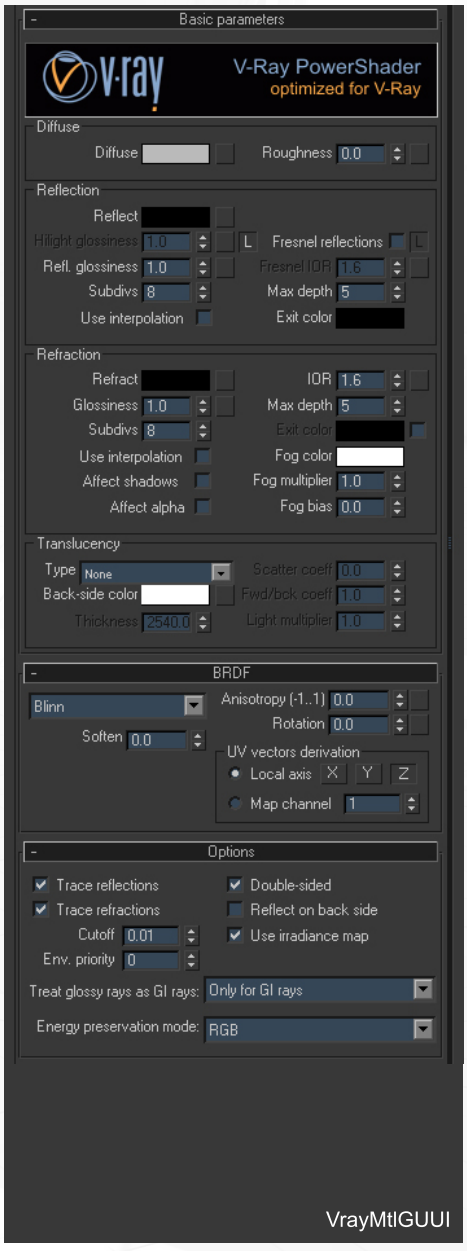
CHAPTER 02

V-Ray Materials + Textures

INTRODUCTION TO V-RAY CHAPTER 02 - V-RAY MATERIALS + TEXTURES

Software Used: V-Ray, 3ds Max

Now that we have had a good look at global illumination in last month's issue, let's dive into the material side of Vray. We will not spend much time delving into the creative side of shader building as this is something completely different, we will rather focus on the technical aspects of Vray materials, figuring out what these buttons do. If you are used to another render engine or just leaving Scanline rendering, this will help.



VrayMtlGUUI

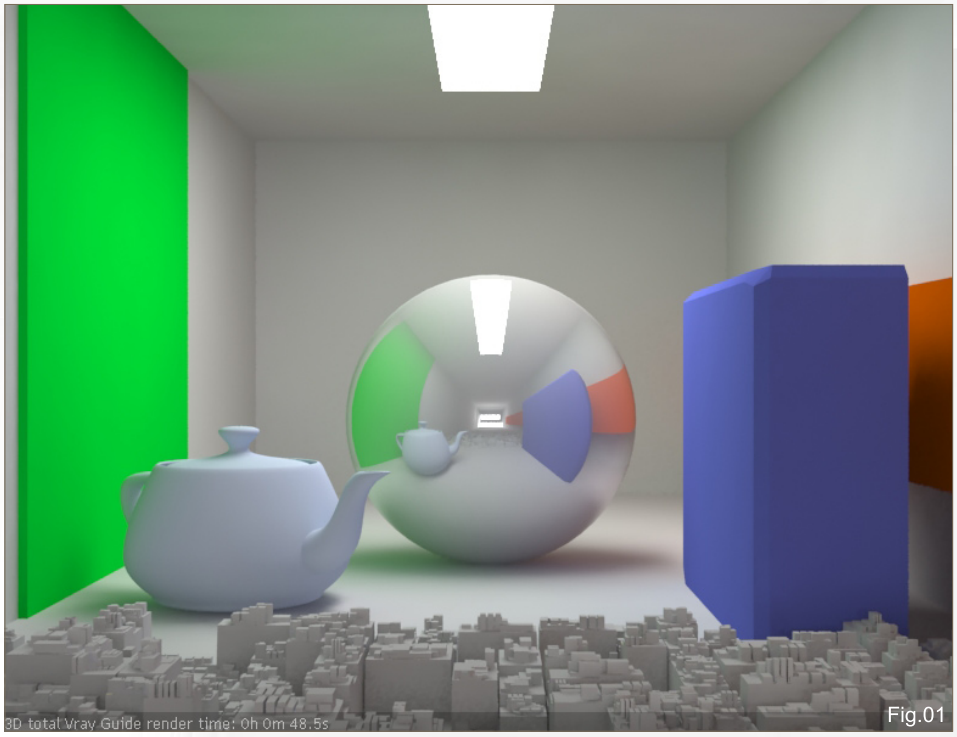


Fig.01

Most settings are common to any render engine and there won't be any example for the usual setting.

A: VRAY MTL

(See **VrayMtlGUUI**) Vray's Bread and butter material is quicker to render than Standard max materials and highly configurable so let's take a look at it.

Roughness: this is used to fake dust on surfaces, not a replacement for an actual texture map.

Highlight glossiness: this controls the amount of specular reflected from the object, usually locked to reflection glossiness. Unlink them if you don't need blurry reflections.

Reflection glossiness: allows blurry reflections, any value under 1.0 will result in blurry reflections which slow down render time considerably. Lower the subdivisions to improve render times, or increase it if you get too blurry or inaccurate results.

You can use Vray's light cache option: Use

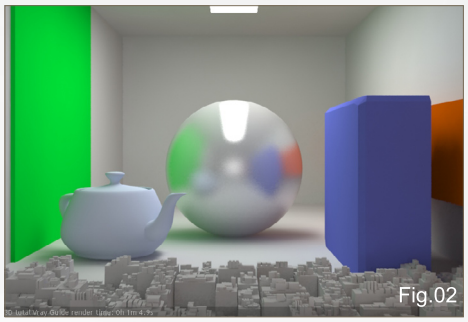


Fig.02

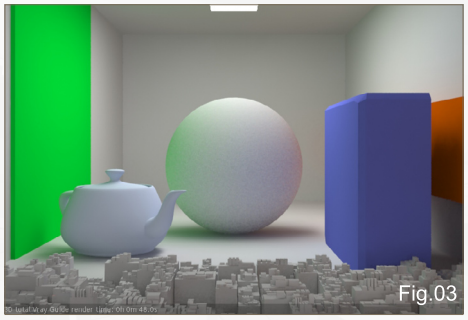


Fig.03

light cache for glossy rays to speed up render but remember however that a low light cache setting will result in incorrect reflections.

Fig.01: 127.127.127 reflection value, 1.0 highlight and reflection glossiness

Fig.02: 127.127.127 reflection value, .75 highlight and reflection glossiness

Fig.03: 127.127.127 reflection value, 0.1

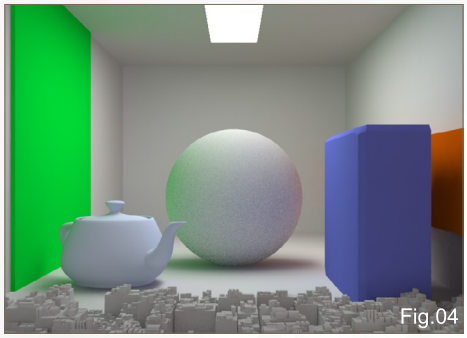


Fig.04

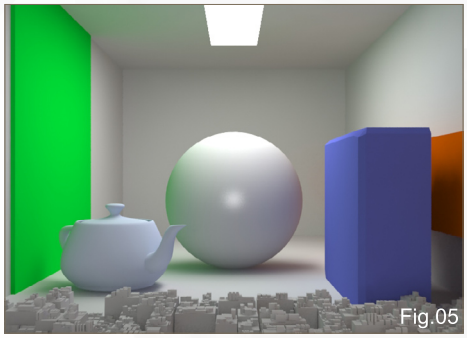


Fig.05

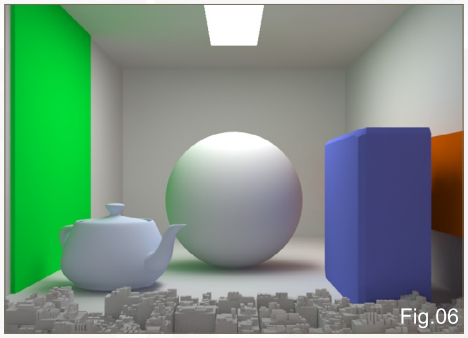


Fig.06

highlight and reflection glossiness subdiv at 8
Fig.04: 127.127.127 reflection value, 0.1 highlight and reflection glossiness subdiv at 2

Fig.05: 127.127.127 reflection value, 0.75 highlight and 1.0 reflection glossiness, no reflections

Fig.06: 127.127.127 reflection value, 0.25 highlight and 1.0 reflection glossiness, no reflections

Max depth: used in reflections and refractions this will set a limit in Vray for how many times a reflection or refraction will bounce inside an object. It can be overridden in Vray's render dialog with more depth resulting in longer calculations.

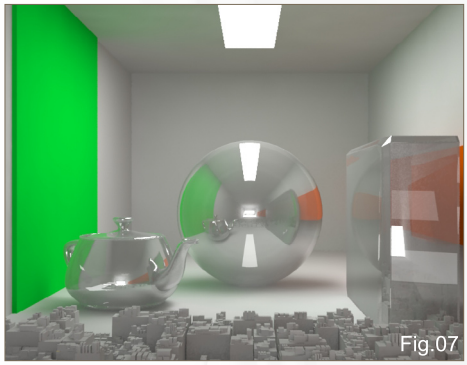


Fig.07

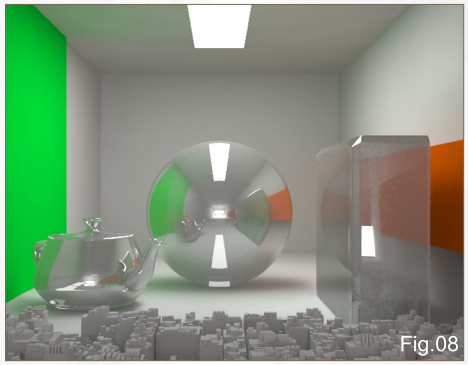


Fig.08

Fig.07: max depth at 5

Fig.08: max depth at 2

Affect shadows: creates transparent shadows through refractive objects, only works with VRay lights

Fog: simulates colored refractive objects, such as dirty water, tinted glass etc… this will change the color of the object as well as the shadows cast from it.

Translucency: basically this is SSS, you need to have a glossy refractive material in order to use this, hybrid model is the most accurate; use back side color to tint the SSS shader. The scatter coefficient determines the ray's angle travelling through the object. 0.0 means light goes in all directions, 1.0 means light can only follow its initial direction.

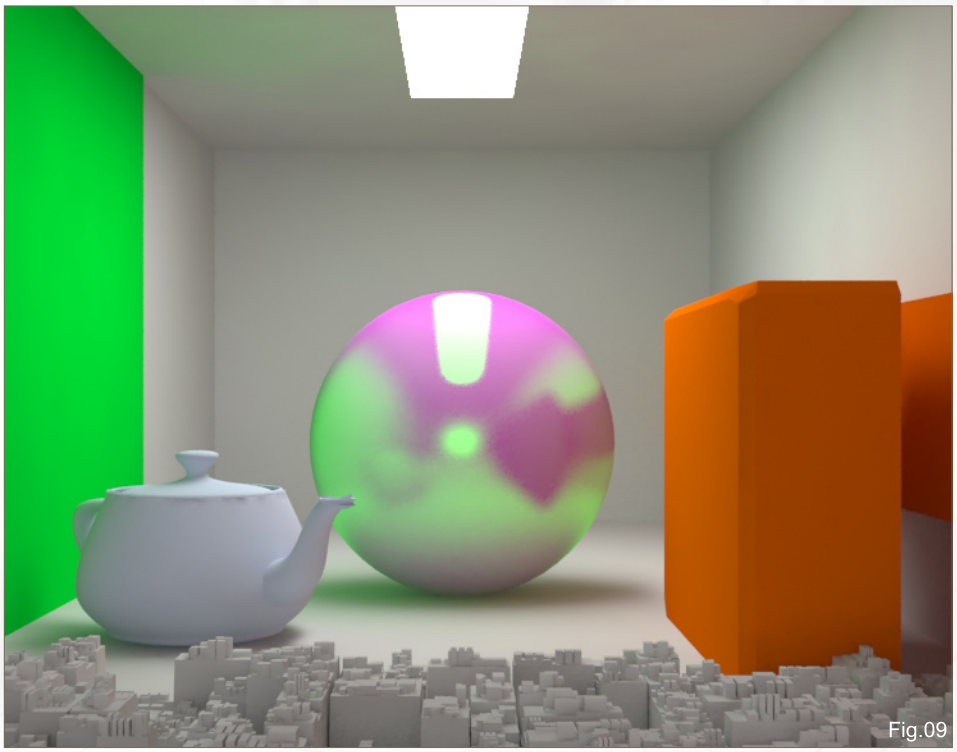


Fig.09

OPTIONS:

- **Cutoff**: threshold to control when to compute or not reflections or refractions, do not set this at 0.0 as it will greatly increase render time (I personally have never changed this setting).
- **Environment priority**: used to prioritize environmental reflection or refraction previously set over reflecting and refracting the actual scene, useful with HDRI environments.
- **Energy preservation mode**:
  - **RGB**: blends the reflection color with the diffuse color in the render **Fig.09**

• **Monochrome**: the reflection color has a very high impact on the final result **Fig.10**

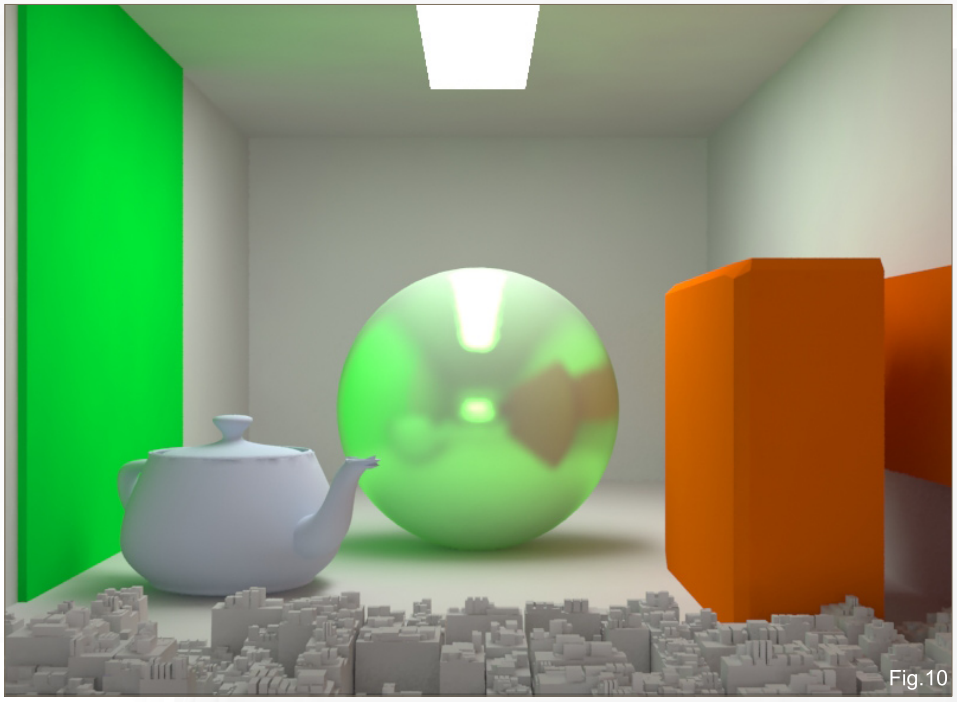


Fig.10

B: VRAY DIRT

(See **VrayBlendMtlGUI**) Used to produce AO maps **Fig.11**, can also be used to blend texture maps along corners. Keep the distribution and falloff at 1.0 for a correct diffuse light, radius depends on scene scale.

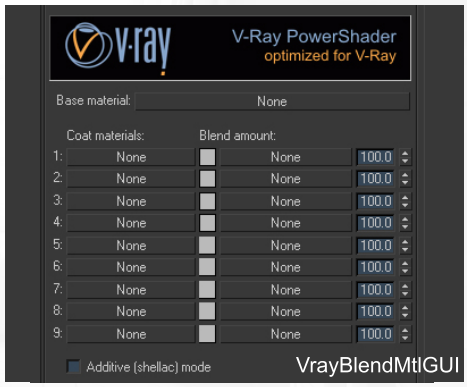
Subdiv: controls the number of samples computed increase this if you have noise; this has a direct effect on rendering time.

Consider same object only: leave unchecked for a global AO render, check it to have a per object AO render.

C: VRAY LIGHT MTL

(See **VrayLightGUI**) Allows you to emit light from an object, bear in mind in most cases you will need to increase the GI solutions settings to produce smooth shadows, especially the hemispherical subdivisions.

You can plug texture maps to the light emission and opacity; this will affect the light strength and color.



VrayBlendMtlGUI

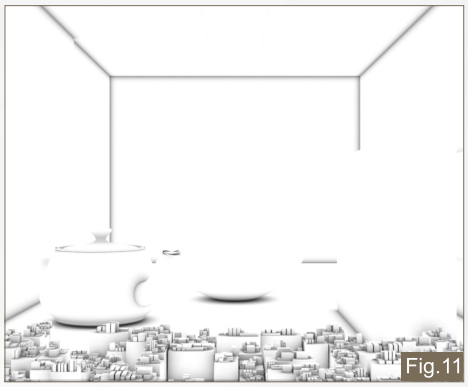


Fig.11

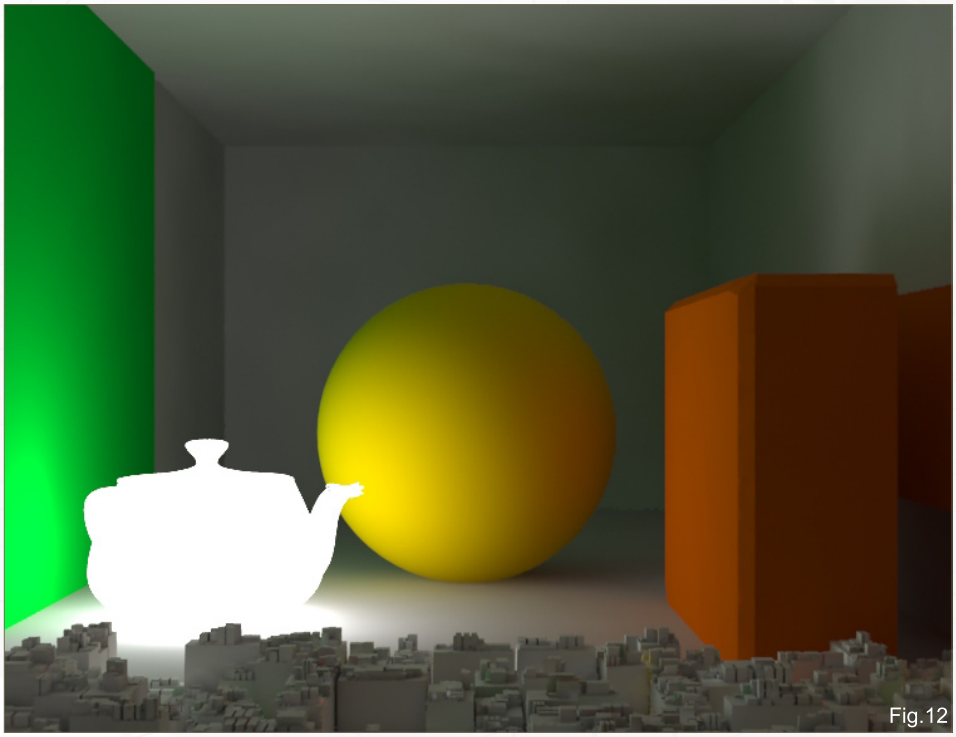
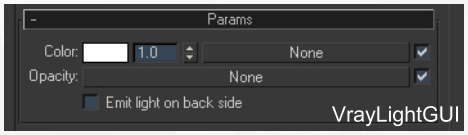


Fig.12



VrayLightGUI

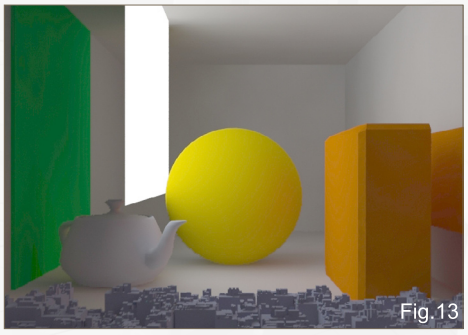


Fig.13

Emit light on back side: applies the double sided option to the light emission.

Fig.12: standard VrayLightMtl setup

Fig.13: standard light setup with a plane

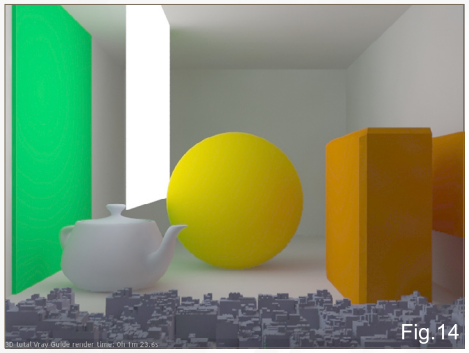


Fig.14

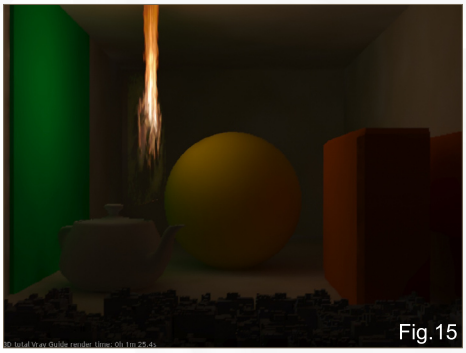
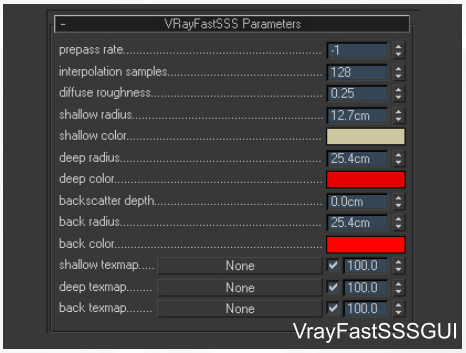


Fig.15



VrayFastSSSGUI

Fig.14: checked emit light on back side

Fig.15: with texture map and opacity map

D: VRAY SSS

(See **VrayFastSSSGUI**) A very difficult shader to use, to be used in conjunction with VRay blend use VrayFastSSS for the base material and plug VrayMtl's into the coat material section. The problem with this SSS setup is the scale, as each radius setting is linked to the scene scale, a high level of precision is required to get this shader to work properly.

Prepass rate: this is the resolution of the SSS solution, -1 means half of the image size, -2 is a quarter etc…

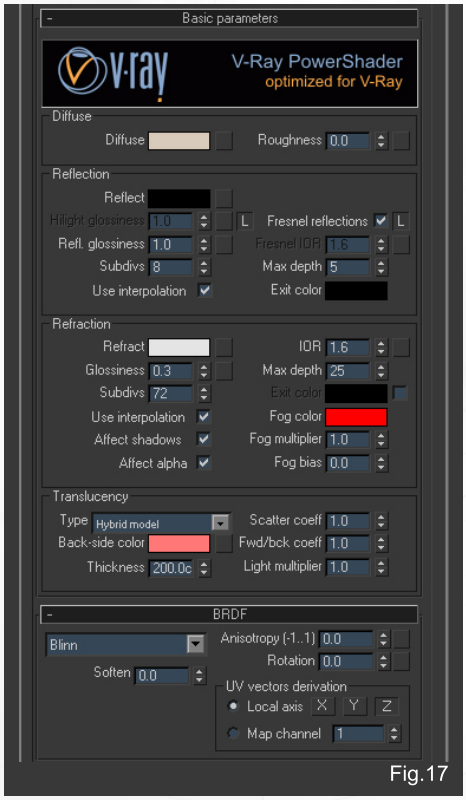


Fig.17


Fig.16

Diffuse Roughness: defines the type of material to simulate, a value of 0.0 is a diffuse material such as skin, a value of 1.0 means a more translucent material such as tinted liquids. I personally don't recommend this particular shader for SSS solutions, either get a hold of VrayFastSSS2, or use basic Vray's translucency and build a material using glossy refractions.

Fig.16: here is an example of a head rendered using VrayMtl with glossy refractions, (**Fig.17**). Render time are quite high due to the subdivisions needed.

E: MORE

VRAY MAP

Used for adding reflection and refraction to standard max shader, use over standard Raytrace map.

VRAY EDGE TEX

Adds edges to an object during render if Scanline rendering is no longer an option, works with both screen and fixe size.

UNSUPPORTED

Raytrace map, reflect refract map, flat mirror map and translucent shader do not work with Vray at this moment.

Same thing for texture baking, only use Vray's texture elements when outputting baked texture maps.

VRAYMTLWRAPPER

(See **VrayMtlWrapperGUI**) Used to create mattes, this can be done under Vray's general object settings, but this material overrides it.

Set the alpha to 1.0 to have the opacity control the alpha contribution to the final render, a value of 0.0 removes the object from the alpha channel, finally a value of -1.0 makes the object cut the alpha.

The reflection and refraction settings only works with a VrayMtl

GI surface ID: use in light cache, change this value if you have light leaks between different objects during light cache calculations.

VRAY2SIDEMTL

(See **2SideMtlGUI**) To be used with planes, puts one material per side, useful for leaves, curtains and paper. **Example**: Plug a dark material in the front section and a light one on the back section, point a light behind the object, turn on "force single-sided sub-materials" and the light shader will be rendered where the light hits.

Fig.18: a light has been placed outside the scene, and the walls have a 2SideMtl plugged with a yellow back color.

F: VRAY OVERRIDEMTL

(See **VrayOverrideMtlGUI**) This will allow you to have additional control over the way reflection, refraction, GI, and shadow works with a particular shader.

You can have one shader for direct visualization, and another for the reflection of the object, or another to control the way light bounces in GI etc...

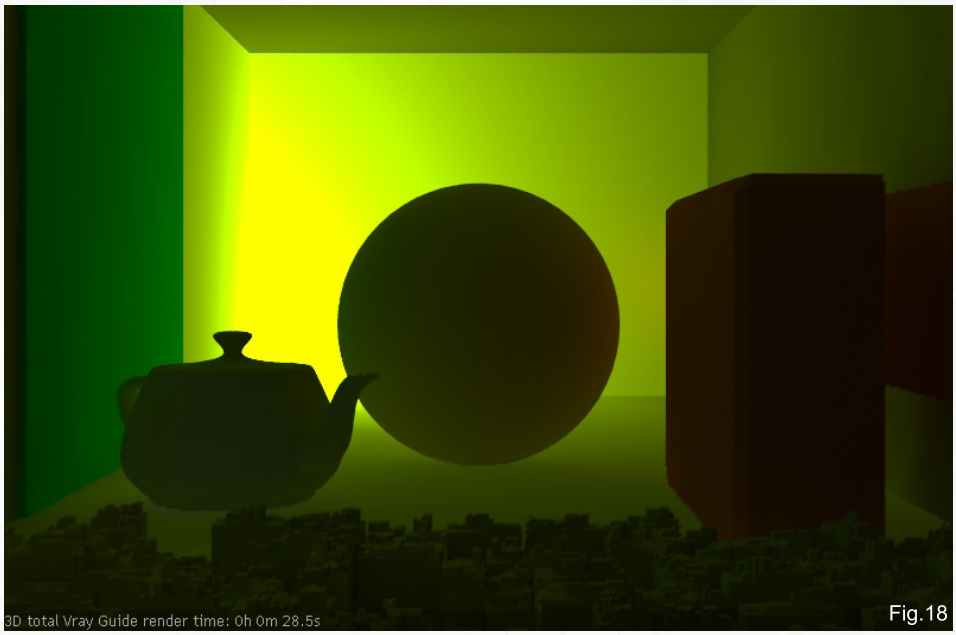


Fig.18

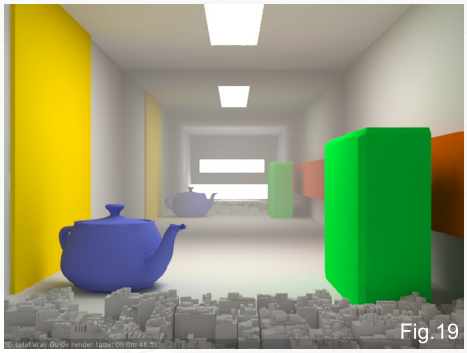


Fig.19

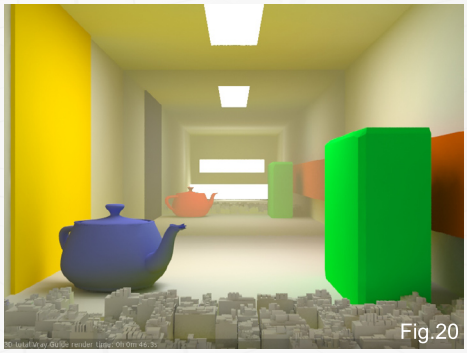
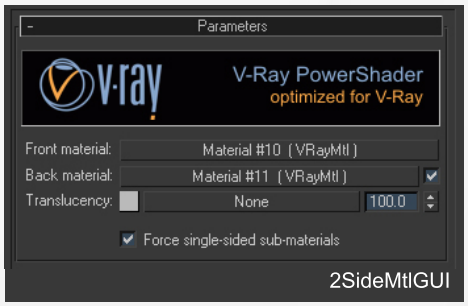


Fig.20

VrayMtlWrapperGUI



2SideMtlGUI

VrayOverrideMtlGUI

Fig.20: scene with override material on the teapot and left panel for reflection, and on the ground floor for GI.

CONCLUSION

Well that was a overview of Vray's materials, pretty much everything is possible with it. One piece of advice would be not to use full white materials if you plan to use any solution of global illumination as this will increase render time unnecessarily. Instead of using 255.255.255 colors just go a little under.

Be sure to catch next month's chapter for more VRay goodies.

ERIC ENNIS

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CHAPTER 03

V-Ray Settings

INTRODUCTION TO V-RAY
CHAPTER 03 - V-RAY SETTINGS

Software Used: V-Ray, 3ds Max

For this section of Vray we will be overlooking at Vray's advanced rendering settings, very useful to know for optimizing render times while increasing quality, or simply troubleshooting. No need to sugar coat it this will not be the funniest chapter of the series

A: GLOBAL SWITCHES

As most settings in here are pretty much self explanatory, some are trickier to handle.

Material Max depth: this will override reflection and refraction max depth, meaning any value you set in the material editor will be ignored for the one you set here.

Filter maps: enables the Antialiasing solution to be applied to loaded textures, same applies for GI.

Secondary ray bias: this will remove all black cutoffs you may get when rendering overlapping faces.

Fig.01: Secondary ray bias at 0.000
Fig.02: Secondary ray bias at 0.001

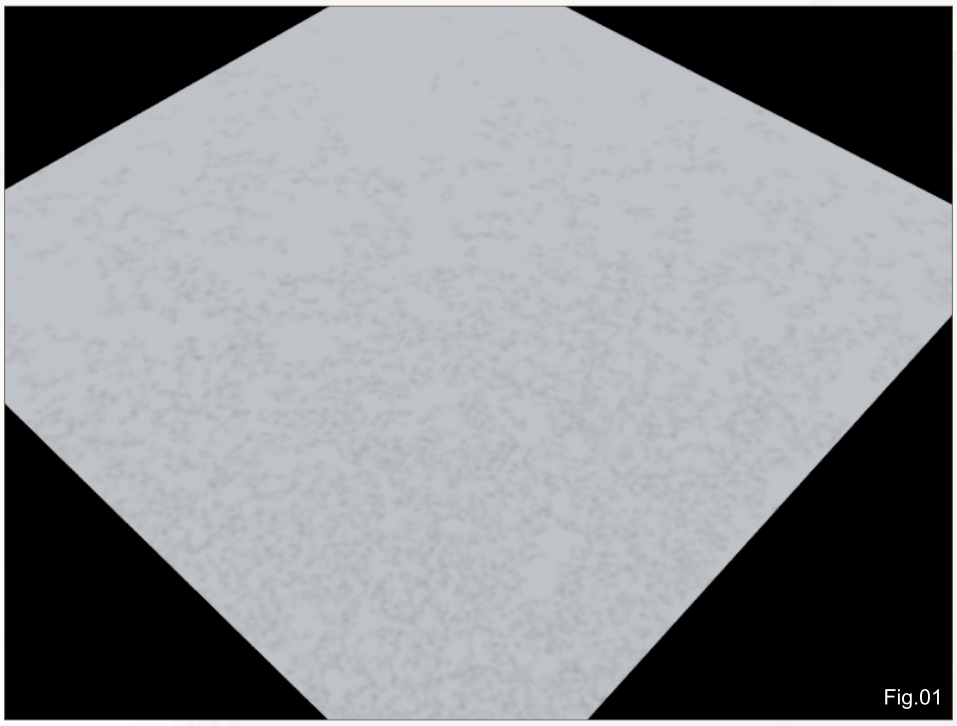


Fig.01

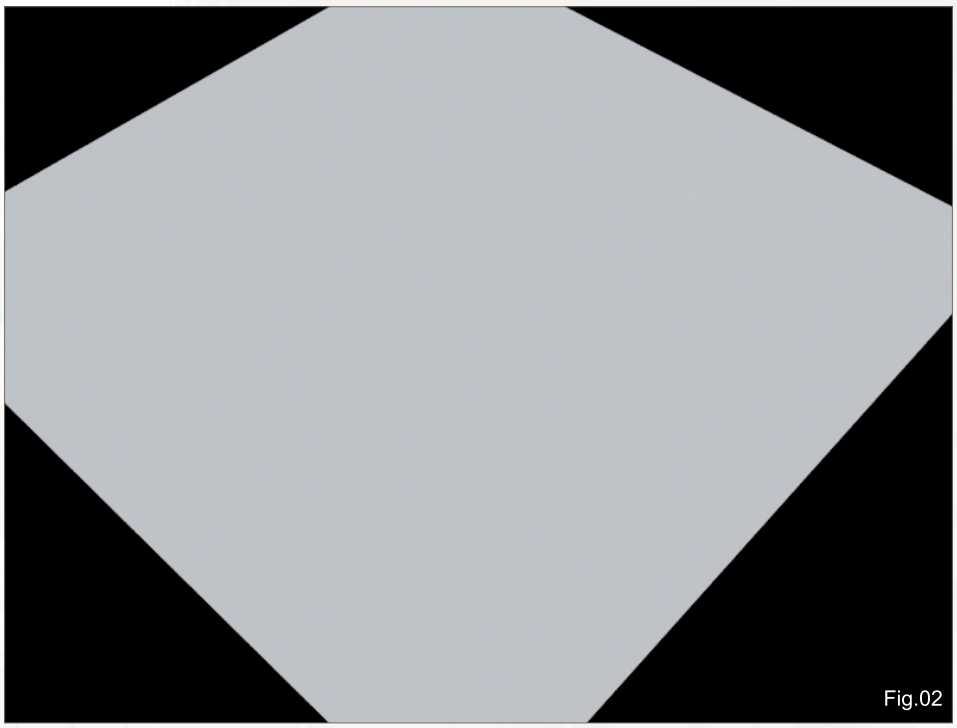


Fig.02

B: IMAGE SAMPLER (ANTIALIASING)

There are three AA solutions in Vray, each with different advantages and shortcomings:

Fixed: a simple yet powerful solution, you determine the number of samples generated per pixel, subdiv value which is squared, meaning you set it to 1 and one sample will be computed per pixel, set it to 4 and 16 samples will be averaged for the final render per pixel.

As you are the one setting the amount of subdivision, Vray doesn't have to spend time figuring it out for each pixel in the image, in very complex scenes where most pixel need to be averaged for a correct aliasing this can speed up render times in very rare cases.

Adaptive DMC: this is the best sampler for heavy scenes, you control the minimum possible samples as well as the maximum, obviously leave the minimum at 1, you rarely need to increase it.

Color threshold: controls the antialiasing for textures, lowering it increases details, you can use this to speed up renders, but this will affect other aspects of the render such as shadows and reflections.

Adaptive subdivision sampler: a very interesting sampler as it can under sample flat surfaces thus speeding up renders while keeping the

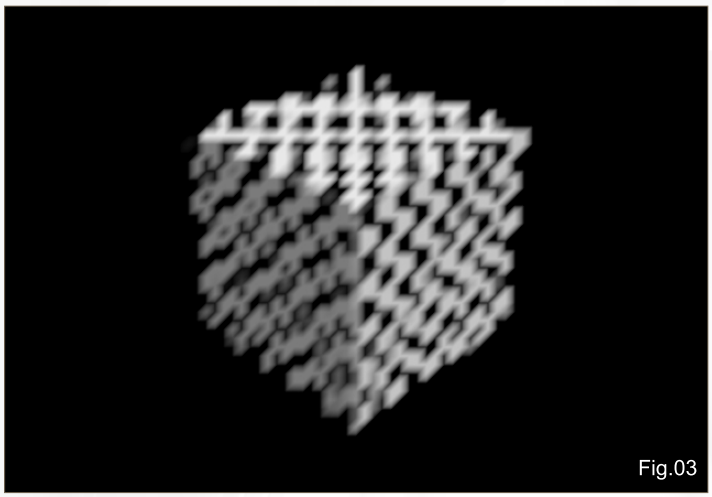


Fig.03

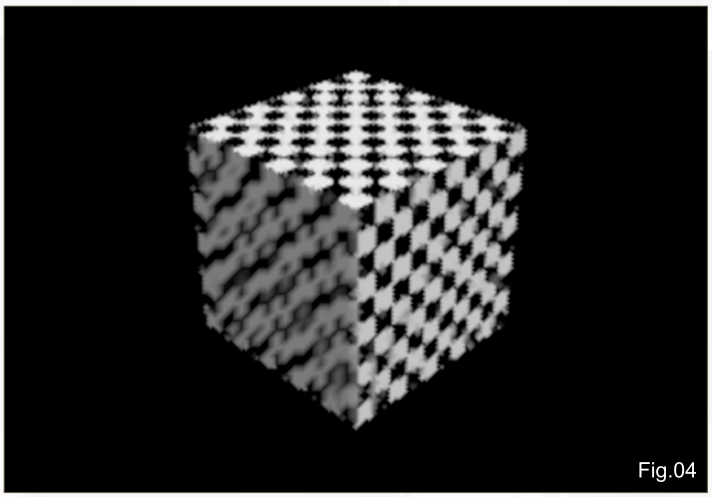


Fig.04

AA sharp where needed, not the preferred solution for complex or texture heavy scenes, furthermore it needs much more RAM the the previous two solutions.

Randomize samples: check this should you have many horizontal or vertical lines.

Color threshold: this affects the antialiasing for textures, with adaptive subdivisions increase to speed up render while sacrificing texture quality, to keep at very low values 0.1, for good results.

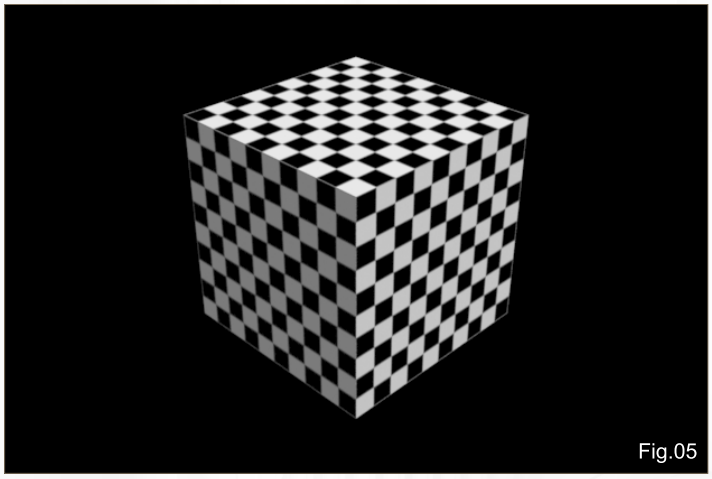


Fig.05

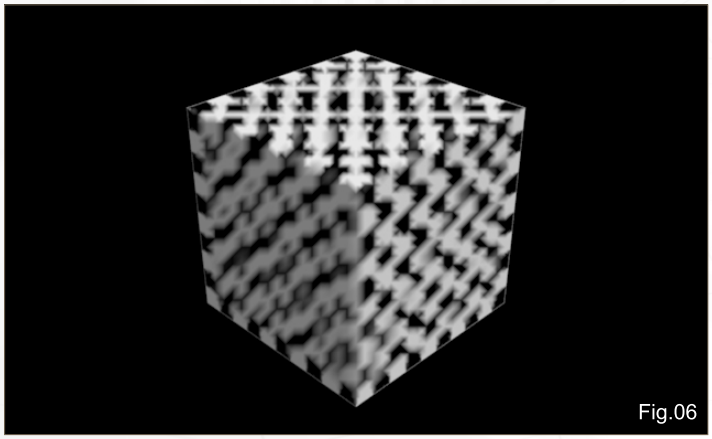


Fig.06

Object outline: this will keep the edges of objects sharp should you set the color threshold to high values , great for speed renders with no regard to texture quality.

Fig.03: color threshold 20.0
Fig.04: color threshold 5.0
Fig.05: color threshold 0.1
Fig.06: color threshold 10 with object outline on

Now which to use and when: in most cases go with adaptive DMC it has great image quality and render speed, and doesn't take much ram: for simple scenes or for previews Adaptive subdivisions is recommended although keep an eye on RAM usage; for very complex scenes where time is not a problem Fixed rate is the way to go, do a region render of the most complex part of the scene to find the subdivisions value needed and hit full render, nothing can go wrong with it you'll just get a little older waiting for it to finish.

C: DMC SAMPLER

Advanced Vray setting, used to control overall image quality, to handle with care as it affects all of Vray's settings, GI, camera effects, glossy reflections and refractions, area lights, motion blur etc…

Each of these settings have a direct effect on image quality and render times.

Amount: decrease for higher quality, controls vray's precision for blurry subjects, and the amount of samples used.

Noise: decrease for higher quality, controls vray's adaptation to blurry reflection, shadows etc..

Min samples: sets the minimum number of samples needed per pixel, as more samples mean a better average increase this for higher quality.

Global subdiv multiplier: multiplies every subdivision setting in the scene, except for light cache, photon maps caustics and antialiasing, however motion blur, reflection samples, depth of filed, irradiance map settings, brute force GI, shadows will be affected.

This simply multiplies every setting by the value set, very useful for quick changes for previews to final render without changing every setting by hand.

Time independent: turned on this will add randomness to the global image noise within GI AA etc.., good for animations as it will change the noise randomness on a per frame basis, rerendering the same frame again will give the same result.

D: Color Mapping

Color mapping changes the images final colors, light values and saturation.
I will not try to explain linear workflow in a few sentences as it is an complete article by itself. If you are not familiar with this, I strongly suggest you look for some reading material about linear workflow or SRGB color space and its advantages.

E: System

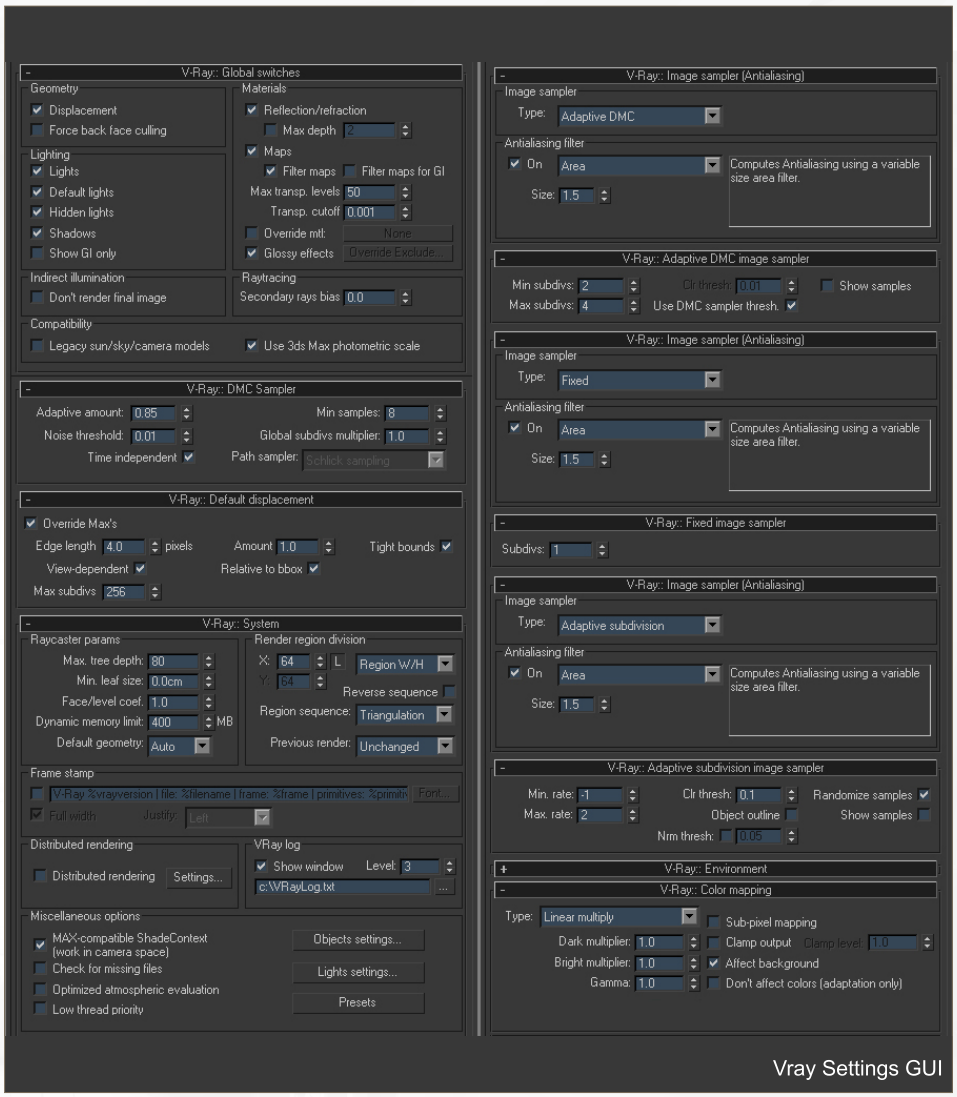
This part of vray settings controls its BSP, which is how vrays creates a 3D grid around your scene cutting it into different parts depending on the geometry to use as less ram as possible and speed up rendering.

Max tree depth: increase to render faster, this will need more memory though.

Min leaf size: leave at 0.0, this changes the way vray decides to divide a scene.

Face/level coef: lower for faster renderings, this will take up much more memory though, can cause max to crash.

Default geometry: this will change the way vrays manages large render with low memory capability, I recommend keeping this on auto.



Vray Settings GUI

Conclusion

Well here we are, not a very visual tutorial I agree, but now you know more about the advanced parameter of vray, and mostly have the ability to start tweaking scenes for optimization, remember every scene is different, there isn't a perfect value for every setting.

If you are getting on with a complex and heavy scene, preferably long before the final render stage; to spend some time testing and tweaking the scene, you can gain a great amount of time having a 1 minute render preview rather than waiting 5, or just knowing how to focus specifically on a certain aspect of the scene, such as modeling, or just AA etc…

Take advantage of saving render settings somewhere on your drive once you find that sweet spot, so that if you ever go too crazy with some settings and forget them later on you have a safe point to go back to, do not be afraid of testing everything but keep an eye on the memory consumption it can become a big surprise once you increase the image size, add textures, or simply enable infinite blurry reflections.

Next a more colorful chapter on lighting!

Eric Ennis

For more from this artist visit
http://www.Eric-Ennis.com

CHAPTER 04

V-Ray Lights

INTRODUCTION TO V-RAY CHAPTER 04 - V-RAY LIGHTS

Software Used: V-Ray, 3ds Max

This month we are going to go over Vray lights and other lighting solutions available in Vray, along with a quick look on caustics, HDRI and Vray Sun.

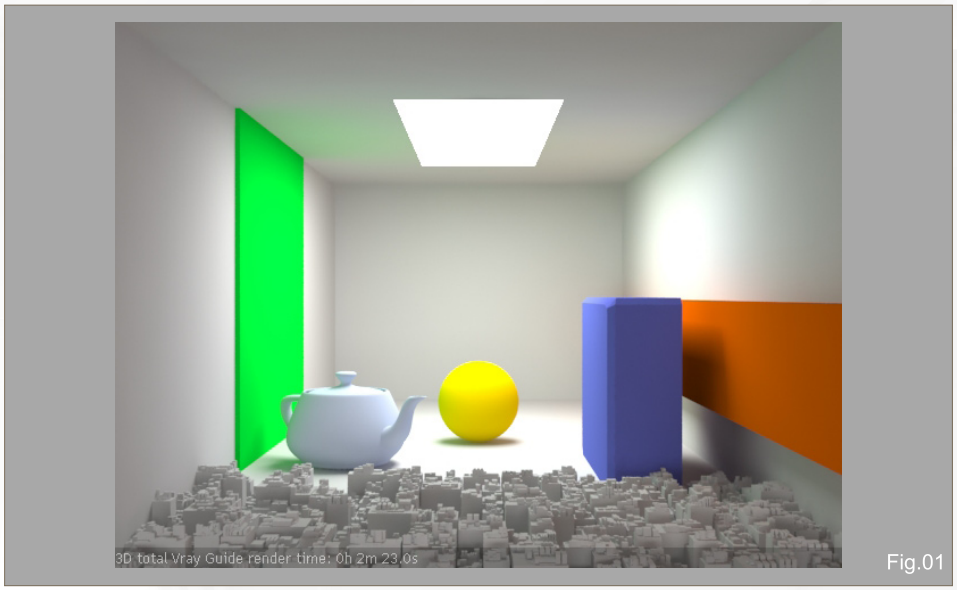


Fig.01

A: VRAY LIGHT

The basic lights can be used within Vray should you want a physically accurate light distribution, this particular light gives very good results but is not the fastest to render especially if you use broad area shadows, let's look at how it works. Firstly, Vray lights have two basic settings, power and size, as in real world, meaning a light source of 100W diffusing light from 10cm² surface will not be as powerful as a 1W light source emitting from a 100m² surface (yes meters).

(**Fig.01**) light power 10, light size 25cm-150cm
(**Fig.02**) light power 10, light size 50cm-150cm

Intensity: Straightforward; increase for more light; however the power of this light means you have the opportunity to use different units in accordance with the scene units and the Vray Physical Camera.

You can use the default image unit which is close to max's standard light setting, but you can also set the light power as luminous power, luminous, radiant, or radiance.

Luminous power (lm): using the unit system, the light power will not depend on light size, as a reference a standard 100W bulb emits 1500 lumens.

Luminance: using this unit the light power will depends on its size.

Radiant power (W): a tricky unit as it is not measured as you would think, for a 100W bulb only a couple watts emitted are visible, this unit also does not use light size.

Radiance: same as above but depends on light size.

Multiplier: light intensity

You can either use intensity or color to set the intensity of the light.

Invisible: defines whether or not the light source is directly visible by the camera or thru reflections/refractions, not that you can still see the light source in windows or such should you keep the affect specular box checked.

(**Fig.03**) notice how the ceiling light is not seen in the render

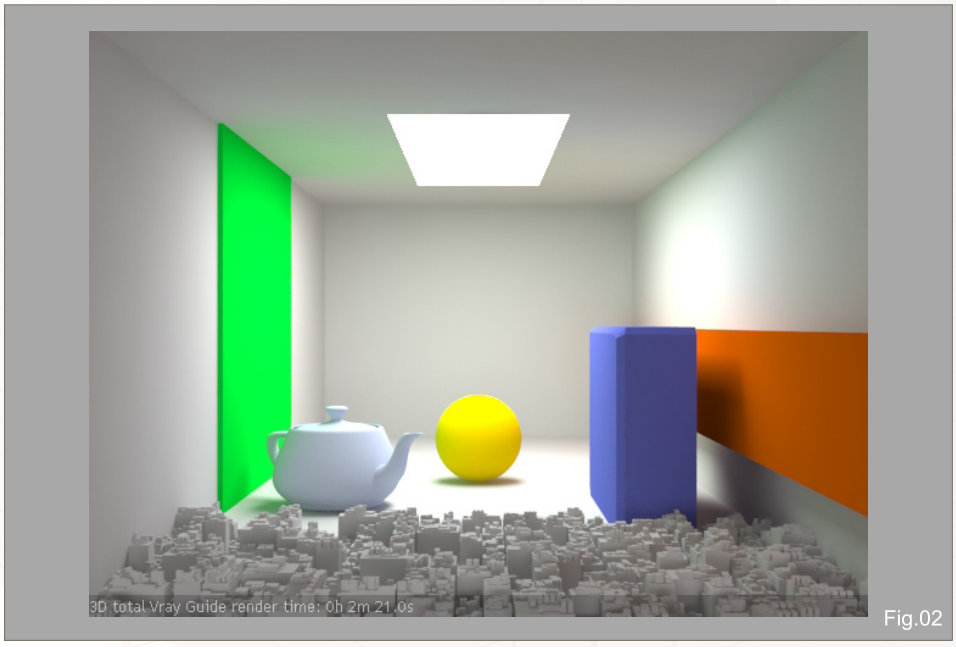


Fig.02

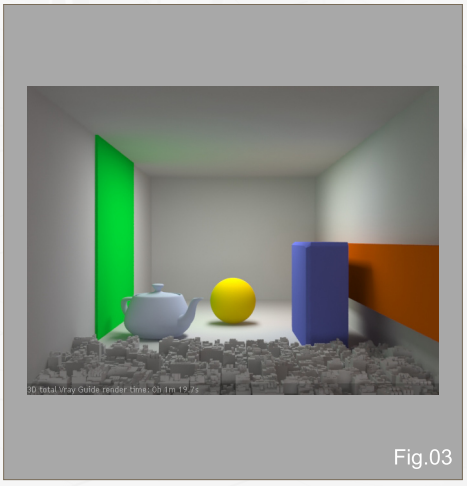


Fig.03

No decay: physically correct lights have an inverse square light decay, so that light intensity fades with distance, you can disable this by un-checking this box.

Skylight portal: when using Image base lighting, this option makes the light source take its intensity from the environment behind it.

Simple portal: speeds up rendering while using skylight portal, by ignoring light casting behind it.

Store with irradiance map: will compute light casting within the GI solution, this will slow down the GI render time, while speeding up final image render time, you can obviously store the solution for quick renders.

Subdiv: used for area shadow calculations, increasing it will produce smoother results, while slowing down the render time.

(**Fig.04**) Fig 72: 8 sampling subdiv
(**Fig.05**) Fig 73: 32 sampling subdiv
(**Fig.06**) Fig 74: 64 sampling subdiv

Shadow Bias: tricky setting, as it will translate the shadows away from objects, this can create strange looking renders, with shadow leaks.

Cutoff: sets a maximum value for light, can be useful in scenes with many lights, keep at 0.0 to have accurate lights; you can always save your image in 16 or 32 bits to have some margin in compositing.

Texture: you can also use Vray lights as a texture projector, only with rectangle, dome, or mesh lights, leave adaptiveness at 1.0,

Note: it is recommended to use GI with texture mapped lights or mesh lights.

(**Fig.07**) Fig 75: single sided
(**Fig.08**) Fig 76: double sided


Fig.04


Fig.05


Fig.06

Fig.07

Fig.08


Fig.09

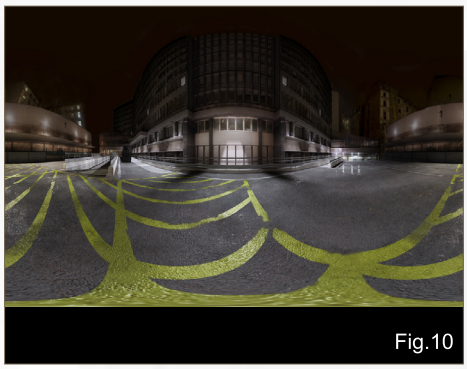


Fig.10

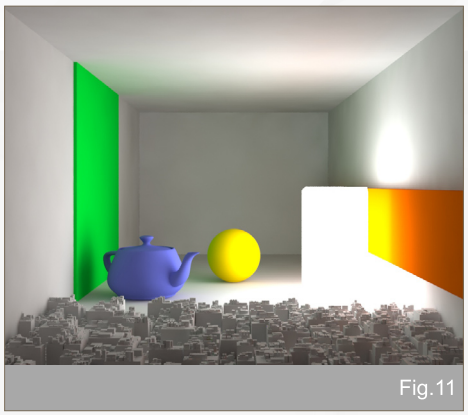


Fig.11

B: Image Based Lighting

With Dome lights you can light an entire scene using IBL, works best with HDR images, you can control the orientation of the image both in the light settings and in the material settings.

(**Fig.09**) Fig 78: teapot light with only a dome light, notice it also affect reflections.
(**Fig.10**) Fig 79: spherical map used

C: Vray Light Mtl

Vray light material is a powerful tool, in its most basic form it works as a planar Vray light, you can add a texture map to it, make it double sided etc.

It also works with complex mesh and particle instances, remember that the larger the surface emitting will be the more hemispherical subdivisions you will have to compute in order to have a smooth and correct render, resulting most of the time, in very long render times.
(**Fig.11**) Fig 80

D: Vray Sun

A particular plugin of Vray can used to simulate sunlight and skylight, depending on the light height and orientation it will automatically change the sky's and lights color, useful for quick setups.

Size: When increasing it will create more diffuse shadows, as decreasing it will make sharper ones, you control the shadow quality with shadow subdivisions, simply increase it for smoother shadows should you get too much noise, however this affects render time.

Turbidity: simulates the amount of dust/pollution present in the air thus creating yellow overall sky and light color; decrease this value for a clear sky, increase it should you need a post apocalyptic mood.

Intensity: normally the height of the sun controls the intensity of the light, however you can bypass this with the intensity multiplier; note: you can also switch to Vray physical camera, increase the ISO setting, lower shutter speed etc… more on this next month.

Ozone: this will change the overall color of the light, increase for bluish mood.

(**Fig.12**) basic sun with Vray physical cam
(**Fig.13**) Fig 82: sun height 500
(**Fig.14**) Fig 83: sun height -500


Fig.12


Fig.13


Fig.14

(**Fig.15**) Fig 84: sun height 5000

(**Fig.16**) Fig 85: turbidity 15

(**Fig.17**) Fig 86: turbidity 5

(**Fig.18**) Fig 87: size multiplier 50

(**Fig.19**) Fig 88: size multiplier 5

(**Fig.20**) Fig 89: height -150, intensity 1

(**Fig.21**) Fig 90: height -150, intensity 3

(**Fig.22**) Fig 91: height -150, intensity 0.1


Fig.15


Fig.16


Fig.17


Fig.19


Fig.18


Fig.20


Fig.21


Fig.22


Fig.23


Fig.24


Fig.25


Fig.26

E: Extra

You can also use Vray shadow solution with standard max light, simply select Vray shadow in the shadow scroll, this is the fastest way to have correct area shadows with Vray. It renders faster than Vray lights, and can easily look the same; however you cannot use Vrays intensity units, and in some cases it might take longer to render.

(**Fig.23**) Fig 92: Vray light 32 shadow subdiv, this took 22 seconds render.

(**Fig.24**) Fig 93: standard max with area shadows light, 28 second render, but with artifacts.

(**Fig.25**) Fig 94: standard max light with Vray shadow with area shadows activated, 13 second render and 8 subdivisions.

(**Fig.26**) Fig 95: standard max light with Vray shadow, with area shadows activated, 13 second render and 16 subdivisions.

This concludes the Lights chapter, I trust you have read the previous ones about GI and Vray's advanced settings to take full advantage of Vray's render engine, this series is to be concluded next months, with a look on Vray's plugins.

Eric Ennis

For more from this artist visit http://www.Eric-Ennis.com

CHAPTER 05

V-Ray Plugins

INTRODUCTION TO V-RAY
CHAPTER 05 - V-RAY PLUGINS

Software Used: V-Ray, 3ds Max

For the final installment we will be looking at some of Vrays extras, some are very important such as displacement, physical camera, or Vray proxy; others are just for fun.

A: VRAY DISPLACEMENT

With Vray you don't plug the displacement map in the material editor. You have to add an object modifier in order to use displacement. (**Fig.01**)

There are three types of displacement mapping in Vray, 2D, 3D and subdivision.

2D is preferred in most cases, this solution keeps all the detail of the displacement map and may use from 8 to 32 bit floating images which gives much better detail, however 2D mapping needs to store the texture during render which can take up a lot of RAM. In such cases render times will become very long and sometimes, max might even crash the computer. In these cases you can either use 3D mapping solutions, or use a very high resolution mesh using Vray proxy. Another downside: 2D mapping doesn't work with procedural maps.

Resolution: preferably match with the textures resolution if the map is 2048*2048 set it to 2048.

Precision: Lower this setting for planar objects to 1, increase for curved objects, if you get spots on the mesh increase this value.

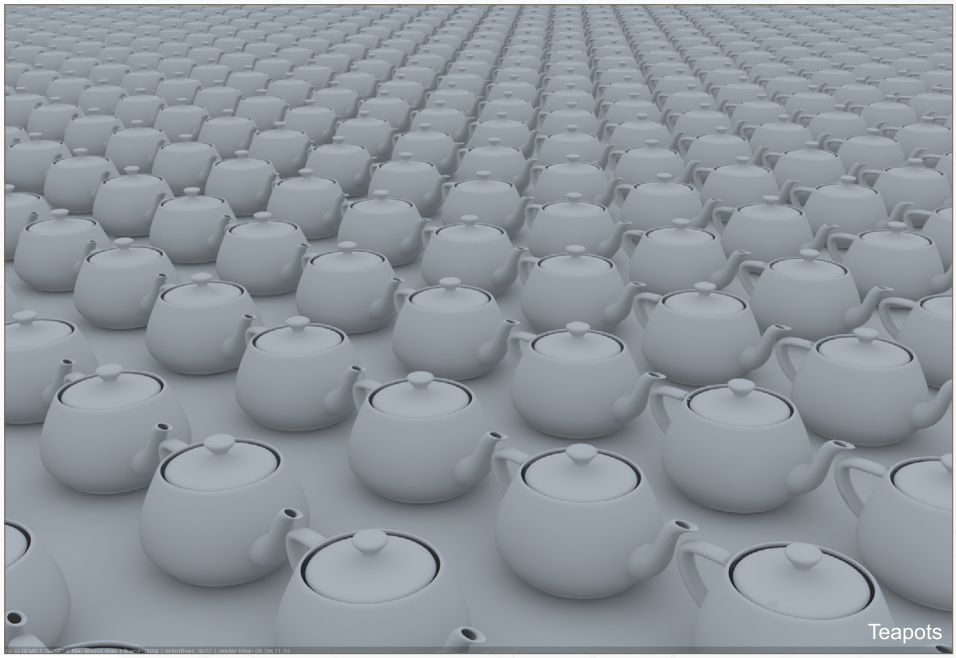
Tight bonds: Check for faster renders, without loss of quality in most cases.

3D Works with procedural maps but only uses 0.0 to 1.0 values, no negatives, and this will not keep all the map details.

Edge length: Controls the edge minimum size of subdivided triangles, lower values means higher quality with longer render times.

View dependent: determines if the edge length is computed on a screen size, or world units. Check this for faster render times this is very useful for landscapes.

Max subdivisions: Controls the number of subdivisions per object triangle squared. For example a value of 64 means for every triangle Vray will subdivide it 64*64=4096 at the most. Simply Increase for more details.



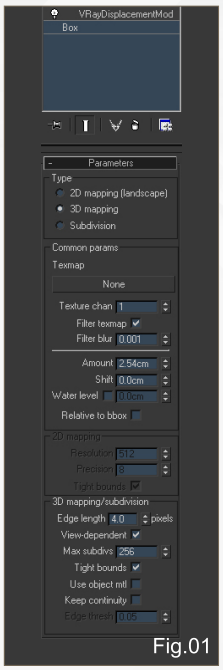


Fig.01

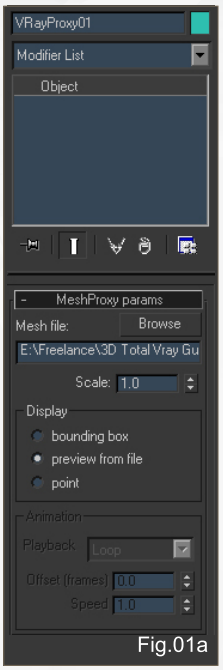


Fig.01a

Keep continuity: Check to remove holes in the displaced mesh.

Subdivision Will work the same way as 3D mapping, but will also smooth the object.
In most cases 2D mapping has the best quality and renders faster, why bother with the others.

Note: Vray's displace does not work with max's standard shadow maps

B: VRAY OBJECTS

Vray proxy: Now here is one of Vrays super powers. Vray proxy lets you render as much polys as you like, far more that Max's limit.

It's quite simple, convert your object into a simple mesh with UV data, whether it is animated or not, export it to your hard drive as a vrmesh file, then, re-import it with proxy object.

If you don't know where to find the Vray export window, just right click in max, then Vray mesh export. (**Fig.01a**)

Note: Once more Vray proxy does not work with standard shadow maps.

Fig: **Teapots**

Here is a render of 10000 teapots each taking around 9000 polys which makes 90 million polygons! It was rendered with GI; all as Vray proxy and a Vray plane and rendered in 2K format. Apart from the hard drive swap RAM used was under 400Mo, and above all it rendered in 2 minutes and 11 seconds.

Vray plane

This is a very useful object. It creates an infinite plane displayed very simply in the viewport.

Vray fur

This is a simple procedural fur plugin within Vray. It is pretty straightforward, but has no dynamics. It would be useful for stills with grass. (**Fig.02**)

C: VRAY CAMERA

A very interesting part of Vray, and quite useful, this is a physically correct camera, with all the settings you would find in a DSLR, a Film camera, and a DVcam. In order to really use this you need some understanding of photography I suggest looking for some info about the basics of photography. With this information you will be at home with these settings. (**Fig.03**)

Note: the cameras shutter speed override motion blur, same for the depth of field.

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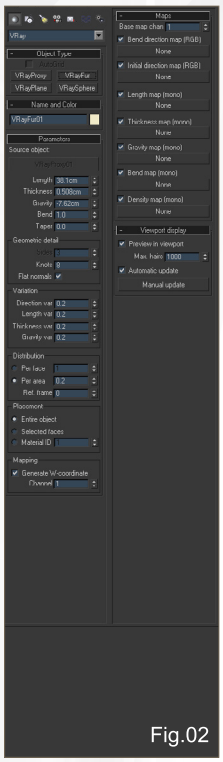
Fig.02

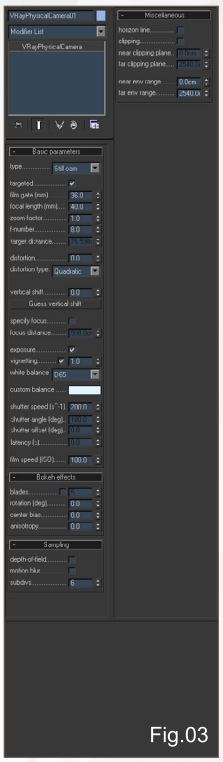
Fig.03

Fig: **Fur**


Fur

Images from 3ds Max + Vray version of this eBook

AVAILABLE FOR: 3DS MAX +VRAY, 3DS MAX + MENTAL RAY, MAYA + MENTAL RAY & CINEMA 4D

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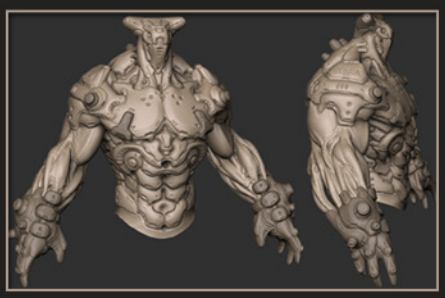

CÉDRIC SÉAUT'S

CHARACTER MODELING

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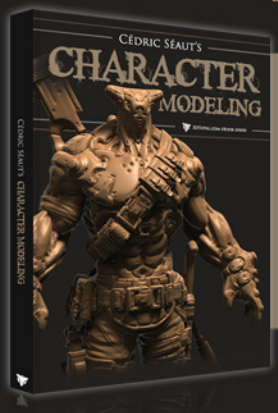

The aim of this 198 page eBook is to provide both an efficient and methodical approach to creating characters that can encompass both organic and mechanical components and equip artists with the knowledge to learn techniques used by industry professionals. The series provides an in depth account of creating a character from the concept and base mesh stages through to the final detailing and high poly sculpt. It will as its subject adopt the theme of an alien humanoid in battle dress, partly clad in armor and carrying weapons.

Original Author: 3DTotal.com Ltd | Platform: ZBrush | Format: DOWNLOAD ONLY PDF | Pages: 198

3ds max

CINEMA 4D

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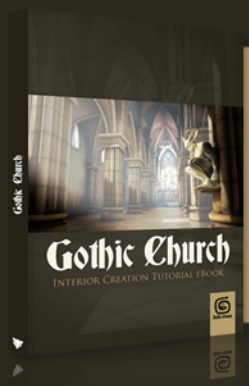
Interior Creation Tutorial eBook



This e-book provides a detailed account of building, texturing and lighting the interior of a Gothic Church based upon a concept painting. The ebook is available in five different platforms. Chapter two however is dedicated to creating a gargoyle in Zbrush – the focal point in our scene. Here the author will start by creating a rough body form using ZSpheres and move through the numerous sculpting phases and modeling the details for each part of the character, highlighting the various brushes and tools used throughout.

Original Author: 3DTotal.com Ltd | Platforms: 3ds max, Cinema 4d, LightWave, Maya and Modo.
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Bonus Sculpting Chapter, FREE Gargoyle model & 51 Total Textures Included

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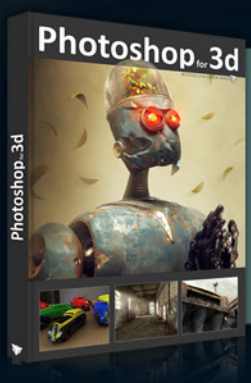

This six chapter eBook aims to show the value of post-production and more specifically the ways in which Photoshop can be used to aid the 3D pipeline. Over the course of six chapters we shall focus on the various tools and techniques on offer in Photoshop that are frequently used to improve 3D renders. Compositing passes, adding particle effects, improving lighting and making general colour adjustments are a few of the topics covered, as well as ways to create backgrounds that both complement and enhance characters. The methods presented within this series can provide an efficient alternative to lengthy render test.

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ZBRUSH CHARACTER CREATION

manimal

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